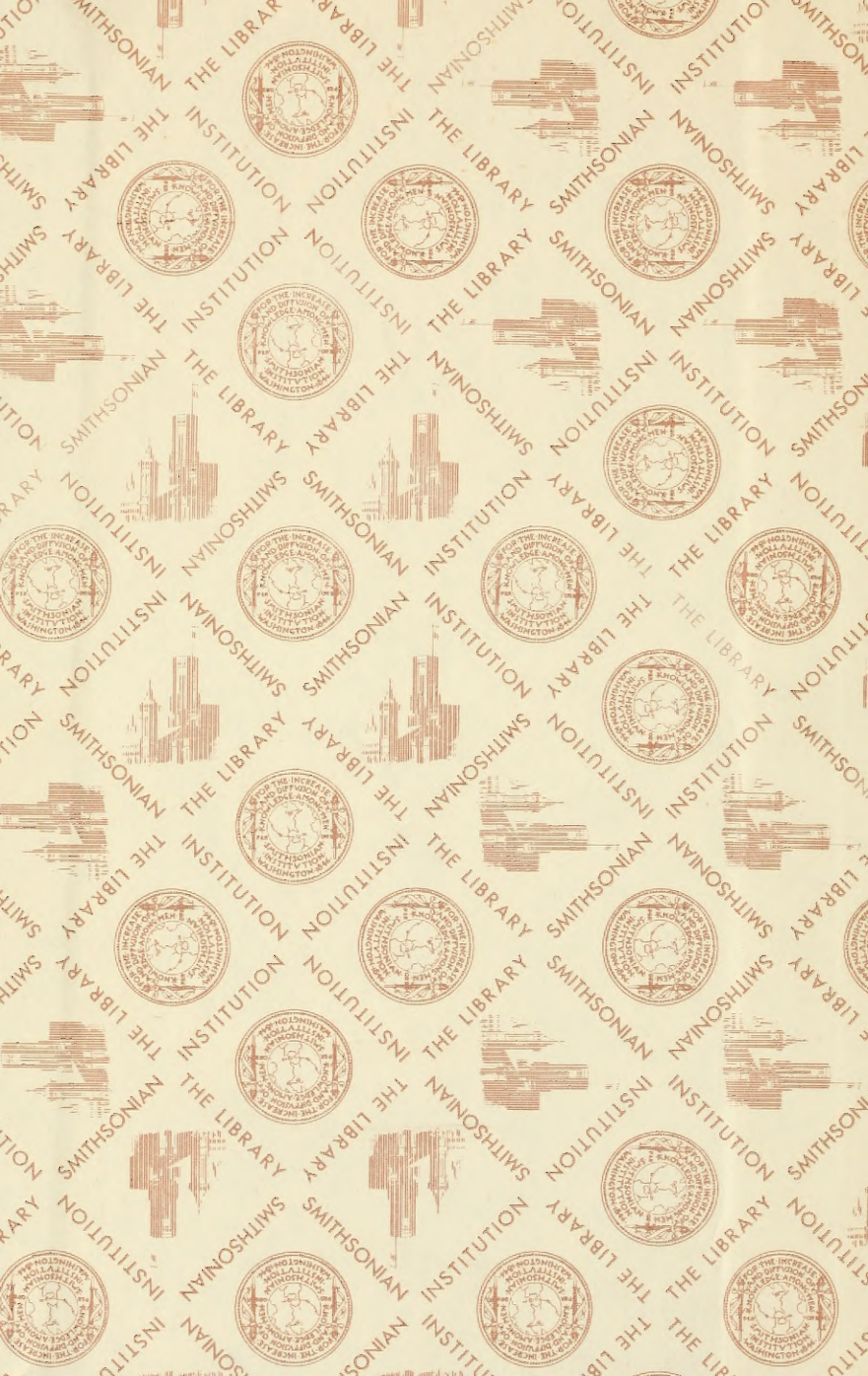
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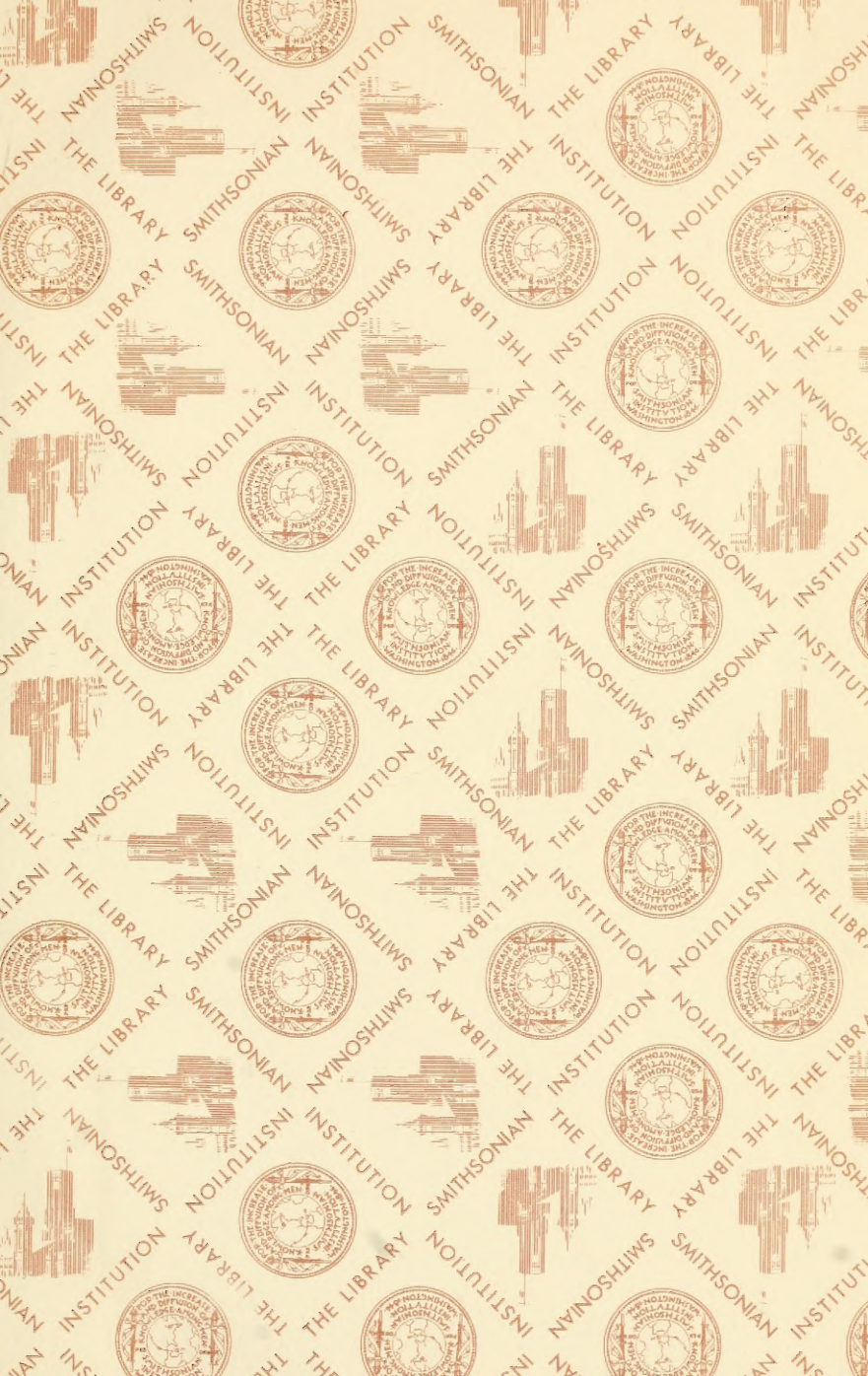
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A CATALOGUE

OF THE

BRITISH NON-PARASITICAL WORMS

IN THE

COLLECTION

OF THE

BRITISH MUSEUM.

BY

GEORGE JOHNSTON, M.D. EDIN.,

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AND LL.D. MARISCHAL COLLEGE, ABERDEEN, ETC.

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SMITHSONIAN
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RED LION COURT, FLEET STREET.

PREFACE.

The publication of this Catalogue of British Non-parasitical Worms has been delayed, owing to the lamented death of the author, Dr. Johnston, while it was still in the Press. A Supplement, prepared by Dr. Baird, containing addenda, corrigenda, and a notice of additional species found since Dr. Johnston's death, with a complete index, have been added, to render the work more complete.

J. E. GRAY.

8th February, 1865.

A CATALOGUE

OF THE

BRITISH NON-PARASITICAL WORMS.

THE Helmintha or Worms are invertebrate soft animals, symmetrically bilateral, or with the viscera arranged on the sides of a longitudinal axis. They are never organically attached to foreign bodies or their own cases, and are capable of progression to a more or less extent. They move forwards, some by a continuous gliding, some by a succession of trails, some by undulations in the water, and others by means of soft appendages and bristles placed along the sides. Diesing's definition of the class is as follows:—"Animalia evertebrata, inarticulata (*i. e.* extremitatibus articulatis nullis prædita), nunc mollia aut elastica, ebranchiata, setis retractilibus nullis (Achæthelmintha); nunc mollia, ebranchiata v. branchiis externis munita, setis retractilibus instructa (Chæthelmintha)."

There are two kinds of Worms,—one which are found within the viscera of living animals, and which cannot maintain their existence in any other situation; and another which lead an exterior life, either entirely independent, or as the external parasites of some aquatic animals. These, however, the parasites can forsake at will, without incurring the penalty of death. It is the second kind of Worms to which this Catalogue is restricted; and they may be conveniently included in the following Orders:—

A. APODOUS: the body without bristles on the sides. = Apoda, *Macleay*. = Achæthelmintha, *Diesing*.

* *Body exannular.*

I. Order. TURBELLARIA. The extremities of the body simple and continuous with it: no distinct head.

†† Eyes two.

6. **Dalyellia.** Mouth terminal.
7. **Derostoma.** Mouth ventral, anterior.
8. **Mesostoma.** Mouth ventral, subcentral.

Suborder II. Teretularia.

The body cavernous, linear-elongate, subcylindrical or compressed, very contractile, sometimes breaking spontaneously into pieces, the surface even and smooth, or rarely wrinkled: head more or less distinct, the mouth a simple terminal or subterminal pore, with a very long included proboscis: intestine undivided, laid in the visceral cavity, with the vent situated well forwards, or posterior and terminal? There is a larger aperture below the head which leads to the common cavity.

* *Acephalous: the anterior end plain.*

12. **Astemma.** Eyeless.
13. **Cephalotrix.** Eyes two, parallel.
14. **Tetrastemma.** Eyes four, in a square.

** *Acephalous, with a furrow on each side of the front.*

20. **Serpentaria.** Body flat, elongate, uniformly coloured, fragile.
19. **Meckelia.** Body linear-elongate, fragile, with paler annulations.

*** *Cephalous, the head indistinct, multocular, and mostly with a shallow furrow on each side.*

15. **Borlasia.** Eyes in a submarginal series: œsophagus simple.
16. **Omatoplea.** Eyes clustered, irregular: the œsophagus with horny stylettes.
17. **Stylus.** Anal extremity armed with a long style.

**** *Ophiocephalous, with lateral furrows.*

18. **Lineus.**

I. TURBELLARIA.

I. PLANARIEA.

Sangsues-limaces, *Reaumur, Hist. Insect*, vi. pref. lviii.
Planaria, *Lam. An. s. Vert.* iii. 176. *Schweig. Handb.* 593. *Dalyell, Pow. Creat.* ii. 96 & 125.
Planariadæ, *Flem. Phil. Zool.* ii. 604.
Planariæ, *Blainville in Dict. des Sc. nat.* lvii. 577; *Ann. & Mag. Nat. Hist.* xvi. 227.
Planarinæ, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.
Anevormi (—), *E. Blanchard in Ann. des Sc. nat.* vii. 105, 106 (1847); and viii. 119, 141 (1847).
Aporocephalæ, *E. Blanchard in Ann. des Sc. nat.* viii. 143 (1847).
Planariea, *Oersted, Entw. Plattw.* 41. *Diesing* (×), *Syst. Helm.* i. 184. *Ray Soc. Rep. Zool.* 1847, 516.
Aprocta, *Schultze, Naturg. Turbell.* 3.

Fam. I. PLANOCERIDÆ.

Cryptocœla, *Oersted, Entw. Plattw.* 44. f. 2. p. 12. *Rep. Ray Soc. Zool.* 1847, 517.

Obs. The body is thin, flat, and laterally expanded, with a plain margin. The eyes, when present, are clustered. The oral aperture is usually closed and becomes almost indistinguishable, but the position of it, and of the proboscis, is marked by an oblong spot near the middle of the ventral surface. This is always paler than the dorsal, which is commonly beautifully coloured. The motion is slow. The food is soft, either the juices of avertebrate animals or the parenchyma of decaying algæ. All are marine, and propagate, probably, by naked ciliated ova, undergoing no metamorphosis. In decay, the body is diffluent; and decomposition has far advanced before life is extinguished.

1. LEPTOPLANA, *Ehrenberg*, 1831*.

Leptoplana, *Oersted, Entw. Plattw.* 48. *Diesing, Syst. Helm.* i. 194.
Prosthiostomum, *Quatrefages in Ann. des Sc. nat.* iv. 133 (1845).
Polycelis, *Quatrefages in ibid.* 132.

Char. Body flat, entire, with a smooth dorsum: mouth subcentral: eyes in two or four clusters: genital pore behind the mouth.

* When, as in this example, the name of the founder of the genus immediately follows the generic name, the date of the latter rests on the authority of Agassiz's Nomenclator Zoologicus. In these instances, I have not had an opportunity of consulting the original authority.

* Eyes in two clusters.

1. **L. subauriculata**, body lanceolate, very thin, obtuse in front, of a yellowish-brown colour; eyes numerous, in two clusters, with a clear circular spot to each cluster, and a clear intervening space. Length 6‴; breadth 2‴.

Planaria subauriculata, *Johnston in Loud. Mag. Nat. Hist.* ix. 16. f. 2.
Leptoplana subauriculata, *Dies. Syst. Helm.* i. 195.
Planaria corniculata, *Dalyell, Pow. Creat.* ii. 101. pl. 14. f. 5.

Hab. The shore between tide-marks.

2. **L. tremellaris**, body ovate, sinuous on the margin, yellowish, unspotted; posterior eye-clusters on a pale spot, irregular, with a line from each running parallel forwards to a minute ocular spot. Length 8–11‴; breadth 3–5‴.

Fasciola tremellaris, *Müll. Verm.* i. ii. 72.
Planaria tremellaris, *Müll. Zool. Dan. Prod.* 223; *Zool. Dan.* i. 36. t. 32. f. 1, 2; copied by *Blainv. Dict. des Sc. nat., Vers, Atlas*, f. 14. *Turt. Gmel.* iv. 67. *Bosc, Vers*, i. 309. *Lam. An. s. Vert.* iii. 180; 2de edit. iii. 608. *Dugés in Ann. des Sc. nat.* xv. 144. pl. 4. f. 14. *Grube, Actin.* 52. *W. Thompson in Ann. & Mag. Nat. Hist.* v. 247.
Leptoplana tremellaris, *Oersted, Entw. Plattw.* 49. *Dies. Syst. Helm.* i. 198.

Hab. In pools among the rocks between tide-marks, under stones.
(*a*) Rothesay, *Miss Macdonell.*

** Eyes in four clusters.

3. **L. flexilis**, body very thin, ovato-lanceolate, widest and semicircular in front, of a dull whitish or pale ash colour; eye-clusters defined by a clear space. Length 7‴; breadth 3‴.

Planaria flexilis, *Dalyell, Planar.* 5. pl. 1. f. 1, 2. *Johnston in Loud. Mag. Nat. Hist.* ix. 17. *W. Thompson in Ann. & Mag. Nat. Hist.* ser. 2. iii. 354. *Dalyell, Pow. Creat.* ii. 102. pl. 14. f. 17–26.
Polycelis fallax, *Quatrefages in Ann. des Sc. nat.* iv. 135. pl. 3. f. 10. (1845).
Leptoplana flexilis, *Dies. Syst. Helm.* i. 194.

Hab. Between tide-marks, generally half-buried in mud: gregarious.

4. **L. atomata**, ovate, obtuse, only a little narrower behind, speckled brown; eyes of the anterior clusters more scattered than of the posterior, not seated on a lighter ground. Length 6‴; breadth 3‴.

Planaria punctata, *Müll. Zool. Dan. Prod.* 2706.
Planaria atomata, *Müll. Zool. Dan.* i. 37. tab. 32. f. 3, 4. *Turt. Gmel.* iv. 65. *Bosc, Vers*, i. 305. *Fleming in Edin. Phil. Journ.* viii. 297.

Leptoplana atomata, *Oerst. Entw. Plattw.* 49. f. 24 (the stylette). *Dies. Syst. Helm.* i. 197.
Planaria maculata (atomata?), *Dalyell, Pow. Creat.* ii. 104. pl. 14. f. 27–32.

Hab. Shores of Scotland, under stones between tide-marks.

5. **L. ellipsis**, oval, with an even margin, reddish, plain or speckled, with a dark mesial line; eye-clusters irregular. Length 5‴; breadth 3‴.

Planaria ellipsis, *Dalyell, Pow. Creat.* ii. 101. pl. 14. f. 9–16.

Hab. Coast of Scotland, *Dalyell.*

2. EURYLEPTA, *Ehrenberg*, 1831.

Eurylepta, *Oersted, Entw. Plattw.* 50. *Diesing, Syst. Helm.* i. 208.
Proceros, *Quatrefages in Ann. des Sc. nat.* iv. 137 (1845).

Char. Body flat and broad, the front with two tentacula continuous with the body: eyes many, clustered on the neck: mouth ventral, anterior.

1. **E. cornuta**, oblong, with a wavy margin, yellowish on the dorsal surface, paler underneath, and spotted with white; tentacula elongate and filiform. Length 5–6‴; breadth 2‴.

Planaria cornuta, *Müll. Zool. Dan. Prod.* 2681; *Zool. Dan.* i. 37. tab. 32. f. 5–7. *Turt. Gmel.* iv. 65. *Bosc, Vers*, i. 305.
Eurylepta cornuta, *Oerst. Plattw.* 50. *Dies. Syst. Helm.* i. 208.

Hab. The coralline region, rare.

2. **E. Dalyellii**, oval, with an even margin, from cream-yellow to ruddy orange, veined dendritically, or uniform; tentacula submarginal, short, triangulate; eyes numerous, clustered at the base of the tentacula. Length 5–15‴; breadth 2–4‴.

Planaria cornuta, *Dalyell, Pow. Creat.* ii. 97. pl. 14. f. 1–4, and pl. 15 (embryo).

Hab. The coralline region. It lurks in the crevices of empty shells; or, usually, lies buried in mud. Apparently not rare on the coast of Scotland, *Dalyell.* Berwick Bay, *Dr. Johnston.*

3. **E. sanguinolenta**, ovate or oval, reddish-brown, veined, with a darker mesial line; tentacula marginal, short, triangular, acute; eyes numerous, in two clusters, coalescent in front. Length 8–10‴; breadth 5–6‴.

Planaria cornuta, *Johnston in Loud. Mag. Nat. Hist.* v. 344. f. 79. *W. Thompson in Ann. Nat. Hist.* xv. 320, and xviii. 392. *Oersted, Entw. Plattw.* 55.

Proceros sanguinolentus, *Quatrefages in Ann. des Sc. nat.* iv. 138. pl. 4. f. 4 (1845).
Eurylepta sanguinolenta, *Dies. Syst. Helm.* i. 209.

Hab. The coralline region.

4. **E. vittata**, ovate, dilated in front, rounded behind, sinuous on the margin, yellowish, with ten or twelve parallel concentric dark lines, the centre white with a median black line; tentacula ear-like, triangulate, speckled with black dots. Length 2″; breadth 1″.

Planaria vittata, *Montagu in Linn. Trans.* xi. 25. pl. 5. f. 3. *Lam. An. s. Vert.* iii. 180; 2de edit. iii. 608. *W. Thompson in Ann. & Mag. Nat. Hist.* v. 247, and xviii. 392. *Harvey, Sea-Book*, 157. fig.
Proceros cristatus, *Quatrefages in Ann. des Sc. nat.* iv. 139. pl. 3. f. 7. (1845).
Eurylepta vittata, *Dies. Syst. Helm.* i. 209.
Eurylepta cristata, *Dies. Syst. Helm.* i. 210.

Hab. The coralline region.
(*a*) Falmouth, *J. Cranch.*

3. PLANOCERA.

Planocera, *Blainville in Dict. des Sc. nat.* lvii. 578 (1828). *Oersted, Entw. Plattw.* 47. *Dies. Syst. Helm.* i. 217.
Stylochus, *Dies. Syst. Helm.* i. 215.

Char. Body flat, with a smooth dorsal surface and an entire margin: a pair of contractile tentacula on the back in front, with or without eyes at their base: mouth with a short proboscis lobed or crenate at the orifice.

1. **Pl. folium**, broadly ovate, yellowish-brown, veined and reticulate, with a linear-oblong pinnated mesial spot; tentacula short, obtuse, with a small cluster of eyes near the base. Length 17‴; breadth 11‴.

Stylochus folium, *Grube, Actin.* 51. f. 12 (1840). *Dies. Syst. Helm.* i. 216.
Planocera folium, *Oersted, Entw. Plattw.* 48.

Hab. The coralline region. Berwick Bay.

Obs. I have seen a single specimen of which a figure was made just when diffluence had begun; but the process had proceeded too far before leisure was afforded of making a description. The specimen agreed very well with Grube's figure.

Fam. II. PLANARIADÆ.

Dendrocœla, *Oersted, Entw. Plattw.* 50. *Ray Soc. Zool. Rep.* 1847, 518.

Obs. The body is oblong, flattish, with an entire margin. The

circular mouth is on the ventral surface near its centre; and the proboscis is often extruded when hunger presses, and food is proffered. The eyes are separate, either in a linear series or in pairs. The motion is quick and continuous. The food is derived from other soft animals or from the parenchyma of plants. They have great powers of repairing wounds, and of reproducing amputated parts. They are not subject to diffluence in dying. They multiply both by self-division and by ova, which are included within a coloured capsule previous to their exclusion, and for some time afterwards. They pass through no metamorphosis. Lacustrine and marine.

4. POLYCELIS, *Ehrenberg*, 1831.

Polycelis, *Diesing, Syst. Helm.* i. 191. *E. Blanchard in Ann. des Sc. nat.* viii. 271 (1847).

Char. Body flattish, oblong, even and smooth, with a linear series of eyes around the anterior margin which is truncate: oral proboscis long and cylindrical, with a plain orifice. Lacustrine.

1. **P. nigra**, of a uniform velvet-black colour, the front sinuated with two marginal and a central projection. Length 5‴; breadth 1½‴.

Limaces aquatiques noires, *Trembley, Mem. Polyp.* 127. pl. 7. f. 9 (1744).
Fasciola nigra, *Müll. Verm.* i. ii. 54.
Planaria nigra, *Müll. Zool. Dan. Prod.* 221; *Zool. Dan.* iii. 48. tab. 109. f. 3, 4. *Turt. Gmel.* iv. 61. *Turt. Brit. Faun.* 128. *Bosc, Vers*, i. 297. *Dalyell on Planariæ*, 23. f. 3–5, and 15. *Johnson in Phil. Trans.* 1825, 254. pl. 16. f. 9–11. *Lam. An. s. Vert.* iii. 178; 2de edit. iii. 606. *Dugès in Ann. des Sc. nat.* xv. 143. pl. 4. f. 10, 15. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 389. *Oersted, Entw. Plattw.* 54. *Dalyell, Pow. Creat.* ii. 122. pl. 15. f. 18, 19 (the ova).
Hirudo nigra, *Kirby in Linn. Trans.* ii. 317.
Planaria fusca, *Penn. Brit. Zool.* iv. 68 (1812).
Polycelis nigra, *Diesing, Syst. Helm.* i. 191.

Hab. Lakes, ditches and rivulets, in pure water, everywhere. It attains a greater size in stagnant than in running water.
(*a*) The Whiteadder, Berwickshire, *Dr. Johnston.*

2. **P. brunnea**, dusky brown, with a dark mesial line; obtusely triangulate in front. Length 4–5‴; breadth 1½‴.

Fasciola brunnea, *Müll. Verm.* i. ii. 54.
Planaria brunnea, *Müll. Zool. Dan. Prod.* 221. *Turt. Gmel.* iv. 61. *Bosc, Vers*, i. 298. *Johnson in Phil. Trans.* 1822, 438. pl. 49. f. 3 & 12. *Baer in Nov. Act. Curios.* xiii. 706. tab. 33. f. 7.
Planaria paniculata, *Dalyell, Planar.* 37. f. 6, 7.
Polycelis nigra, var. brunnea, *Dies. Syst. Helm.* i. 192.

Hab. Ponds.

3. **P. felina**, linear-oblong, minutely tricuspidate in front, of a uniform dark brown, paler underneath. Length 8‴; breadth 1½‴.

Planaria felina, *Dalyell on Planariæ*, 42. f. 8 (1814).
Planaria cornuta, *Johnson in Phil. Trans.* 1822, 437. pl. 49. f. 1, 7, 9, 10, 13 & 16; and *lib. ibid.* 1825, 249 & 251. pl. 16. f. 1, 2, 4–8.
Planaria viganensis, *Dugés in Ann. des Sc. nat.* xxi. 84, 91. pl. 2. f. 23 (1830).
Polycelis nigra, var. viganensis, *Dies. Syst. Helm.* i. 192.

Hab. Stagnant waters in which aquatic vegetables abound: rarely in springs.

Obs. Longer in proportion to its length than the preceding, and more decidedly auricled in front: in shape it is rather elliptical than oblong, tapering backwards from about the middle; whereas in *nigra* and *brunnea*, the sides, a little sinuated behind the head, continue parallel until near the tail, which is narrowed and obtuse.

5. PLANARIA.

Planaria, *Müll. Zool. Dan. Prod.* xxviii. (1776). *Blainville in Dict. des Sc. nat.* lvii. 578. *Oersted, Entw. Plattw.* 52. *Diesing, Syst. Helm.* i. 202.

Char. Body narrow-oblong, flattish, the front truncate, more or less auricled on each side, the tail rounded: eyes two, placed on the anterior part of the back, parallel.

* Freshwater.

1. **P. lactea**, white, roseate or brownish, with a milk-white mesial spot. Length 6–9‴; breadth 1½–2‴.

Fasciola lactea, *Müll. Verm.* i. ii. 61.
Planaria lactea, *Müll. Zool. Dan. Prod.* no. 2687; *Zool. Dan.* iii. 47. tab. 109. f. 1, 2. *Turt. Gmel.* iv. 64. *Stew. Elem.* ii. 355. *Bosc, Vers*, i. 303. *Rees' Cyclop.* xxvii. *verb. Planaria. Blainv. Dict. des Sc. nat.* lvii. 578. *Lam. An. s. Vert.* iii. 179; 2de edit. iii. 607. *Johnson in Phil. Trans.* 1822, 438. pl. 49. f. 4, 5, 11, 15 & 17. *Baer in Nov. Act. Curios.* xiii. 705. tab. 33. f. 1, 2, 8–11 (1826). *Dugés in Ann. des Sc. nat.* xv. 144. pl. 4. f. 12; *Edin. Journ. Nat. and Geogr. Sc.* iii. 242 & 243. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 388. *Dalyell, Pow. Creat.* ii. 107. pl. 16. f. 5–9, and pl. 15. f. 4–6. *Dies. Syst. Helm.* i. 203.
Hirudo alba, *Kirby in Linn. Trans.* ii. 316.
Planaria alba, *Turt. Brit. Faun.* 129.
Dendrocœlum lacteum, *Oersted, Entw. Plattw.* 52.

Hab. In cold springs and lakes, not common: gregarious.

Obs. The front is truncate and even, scarcely auricled. There are occasionally four eyes, when the anterior pair is very minute. Readily distinguished by its white colour. Dark individuals owe their taint to the substance they have been recently feeding upon; and resume their natural fairness after a short abstinence.

2. **P. torva**, cinereous or black on the dorsal, greyish on the ventral surface; the front obtuse, rounded on the angles and projecting in the centre; eyes each with a white halo. Length 6‴; breadth 1½–2‴.

Fasciola torva, *Müll. Verm.* i. ii. 62 (1773).
Planaria torva, *Müll. Zool. Dan. Prod.* no. 2688; *Zool. Dan.* iii. 48. tab. 109. f. 5, 6. *Turt. Gmel.* iv. 64. *Bosc, Vers*, i. 303. pl. 8. f. 9. *Lam. An. s. Vert.* iii. 179; 2de edit. iii. 607. *Blainv. Dict. des Sc. nat. Atlas Entomoz.* pl. f. 11 (where it is given as a magnified figure of *Polycelis nigra*). *Baer in Nov. Act. Curios.* xiii. 705. tab. 33. f. 4–6 & 12–17. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 389; *ibid.* ser. 2. vii. 502. *Oersted, Entw. Plattw.* 54. *Dies. Syst. Helm.* i. 205. *Moquin-Tandon, Monogr. Hirud.* 200.
Hirudo alpina, *Dana in Moquin-Tandon, Monogr. Hirud.* 17 & 200, note 3.
Planaria fusca, *Rees' Cyclop.* xxvii. *art. Planaria. Stew. Elem.* ii. 355. *Templeton in Loudon's Mag. Nat. Hist.* ix. 239. *Byerley, Faun. Liverp.* 99.
Planaria subtentaculata, *Dugés in Ann. des Sc. Nat.* xv. 144. pl. 4. f. 13, 22–24.

Hab. In lakes and runlets, more especially in those descending from elevated grounds. I believe rare.

Obs. I can find no proof that *Pl. fusca* of Pallas or of Dugés (for it is not certain that they are synonymous) is indigenous. Those authors who have introduced it into their lists have not critically examined the genus. The same remark may be made of *Planaria stagnalis*, Müll. Templeton has introduced it into his Irish list (*Loud. Mag. N. Hist.* ix. 239); but he gives no description, nor mentions any locality.

3. **P. arethusa**, truncate and auriculate in front, leaden or slate-grey, paler underneath; a black eye on a white spot on each side of the medial line in front. Length 6‴; breadth 1‴.

Planaria arethusa, *Dalyell, Planar.* 85. f. 11–14. *W. Thompson in Ann. & Mag. Nat. Hist.* ser. 2. vii. 502. *Dalyell, Pow. Creat.* ii. 111. pl. 16. f. 10–19.
Planaria torva, *Johnson in Phil. Trans.* 1822, pl. 49. f. 2, 8, 14, and *ibid.* 1825, 251.

Hab. In pure springs and rivulets: common.
(*a*) Dods'-well, Berwick, *Dr. Johnston.*

4. **P. edinensis**, linear-oblong, rather narrowish forwards, pale carnation; head obtuse, rose-colour; eyes nearly marginal in the rose-coloured part. Length 3‴; breadth 1‴.

Planaria edinensis, *Dalyell, Planar.* 133. f. 18 (1814). *Dies. Syst. Helm.* i. 282.
Dalyellia edinensis, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 438.

Hab. In pure springs: rare.

** Marine.

5. **P. ulvæ**, of an olive mottled colour, with a pale abbreviated mesial line; front truncate, distinctly auricled; the tail truncate or more commonly emarginate. Length 5‴; breadth 1½‴.

Planaria ulvæ, *Oersted, Entw. Plattw.* 53. f. 5. *Dies. Syst. Helm.* i. 205.

Hab. At the roots of the Laminariæ between tide-marks.
(*a*) Berwick Bay, *Dr. Johnston.*

6. **P. affinis**, linear-oblong, rounded and slightly enlarged at the front, of a wood-brown colour, with an oblong white line on the posterior half; eyes a little behind the front, each in the centre of a white spot on the sides of the mesial line. Length 3‴; breadth ⅔‴.

Planaria affinis, *Oersted, Entw. Plattw.* 54 (1844). *Dies. Syst. Helm.* i. 206.
Planaria hebes, *Dalyell, Pow. Creat.* ii. 107. pl. 16. f. 3, 4.

Hab. Amongst algæ between tide-marks.

7. **P.? alba**, linear-oblong, obtuse at both extremities, the anterior narrowest; pure white; eyes black, placed backwards and wide apart. Length 3‴; breadth ½‴.

Planaria alba, *Dalyell, Pow. Creat.* ii. pl. 16. f. 21, 22.

Hab. Shores of Scotland, *Dalyell.*

Obs. Dalyell remarks that the intestinal canal is not pinnate.

8. **P.? variegata**, linear-oblong, a little bulged in the middle, truncate in front, acuminated behind, fasciated across the back with black and yellow belts; eyes two, black, considerably apart. Length 1½‴; breadth ¾‴.

Planaria variegata, *Dalyell, Pow. Creat.* ii. 115. pl. 16. f. 20.

Hab. Coast of Scotland, very rare, *Dalyell.*

Obs. This may prove to be a species of the molluscous genus *Limapontia*. "This is a beautiful animal, plump and heavy, the belly flattened. In crawling up the side of a vessel, it is liable to drop to the bottom, but its descent seems to be retarded by an invisible thread."—*Dalyell.*

The following are doubtful members of this family:—

Planaria gracilis, body rather linear, acute behind, flattened, white; eyes two, black, placed forwards. Length ⅓‴.

Planaria gracilis, *Dalyell, Pow. Creat.* ii. 116. pl. 16. f. 23.

Hab. Lochend, *Dalyell.*

Obs. The mouth is apparently below, under the eyes. The motion is swift; and the creature can swim in the water.

Planaria falcata, body flattened, thick and fleshy, linear-elongate, rounded and equal at both ends; eyes two, lateral, red. Length 1–2‴.

Planaria falcata, *Dalyell, Pow. Creat.* ii. 117. pl. 16. f. 26–29.

Hab. Lochend in autumn, *Dalyell.*

Obs. "Two red crescents apart on the extremity of the head, in a circular position, but under considerable magnifiers, appearing red streaks, sometimes consisting of one or two confluent pair indistinctly seen. The mouth seems in front; and the intestine a longitudinal series of cavities, with some enlargement in their course. Crawls on the belly, or swims swiftly through the water."—*Dalyell.*

Fam. III. DALYELLIDÆ.

Rhabdocœla, *Oersted, Entw. Plattw.* 59. *Ray Soc. Zool. Rep.* 1847, 518. *Schultze, Naturg. Turbell.* 5.

Gyratricinea, *Diesing, Syst. Helm.* i. 218.

Obs. An artificial group, but associated by a general resemblance in form, and by similarity in habits. They are small animals, of a parenchymatous consistency, in which it is often difficult to trace any distinctly defined viscera, or their openings on the surface. The body is acephalous, and more or less contractile, with an entire margin. They are either marine or lacustrine; and the latter, in general, lay their eggs enclosed in a cocoon or capsule. Of the mode in which the marine genera are propagated, nothing appears to be known.

6. DALYELLIA.

Dalyellia, *Fleming, Phil. Zool.* ii. 605 (1822).
Prostoma, *Oersted, Entw. Plattw.* 62.

Char. Body somewhat compressed vertically, elliptical; the mouth terminal; eyes two, parallel, posterior to the mouth and dorsal. Ova capsulated. Lacustrine.

1. **D. helluo**, narrowed at both ends, most so posteriorly, of a uniform grass-green colour with a transparent margin; eyes black. Length 1–1½‴.

Fasciola helluo, *Müll. Verm.* i. ii. 64.
Planaria helluo, *Müll. Zool. Dan. Prod.* no. 2692; *Zool. Dan.* iii. 39. tab. 105. f. 3. *Turt. Gmel.* iv. 65. *Bosc, Vers*, i. 304.
Hirudo viridis, *Shaw in Linn. Trans.* i. 94. pl. 7. *Johnson on Medic. Leech*, 19. *Blainv. Dict. des Sc. nat.* xlvii. 268.
Planaria viridis, *Turt. Brit. Faun.* 129. *Stew. Elem.* ii. 355.
Planaria graminea, *Dalyell, Planar.* 42. f. 8; *Pow. Creat.* ii. 119.
Dalyellia graminea, *Flem. Phil. Zool.* ii. 605. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 438.

Distigma? helluo, *Dies. Syst. Helm.* i. 188.
Vortex viridis?, *Schultze, Naturg. Turbell.* 47.

Hab. Stagnant water.

Obs. The cocoon is brown and oval, apparent near the posterior end: it contains from four to twelve ova.

2. **D. exigua**, ovate-oblong, broadest behind, reddish; eyes black. Length $\frac{1}{3}'''$.

Planaria exigua, *Dalyell, Pow. Creat.* ii. 116. pl. 15. f. 13, 14.

Hab. Ponds.

Obs. When in motion, the form is that of a double cone.

7. DEROSTOMA.

Derostoma (—), *Dugés in Ann. des Sc. nat.* xxi. 76 (1830). = *Oerst. Entw. Plattw.* 66 (1844).

Char. Body linear-oblong, rounded at both ends, with two eyes or none: mouth pitcher-shaped, concealed, opening by a longitudinal fissure on the venter.

1. **D. unipunctatum**, plump, narrowed towards the anterior extremity, and obtuse behind, dingy yellow; eyes two, yellow. Length 3'''; breadth 1'''.

Derostoma unipunctatum, *Oersted, Entw. Plattw.* 66. tab. 2. f. 25.
Turbella unipunctata, *Dies. Syst. Helm.* i. 225.
Planaria fodinæ—the Quarry Planaria, *Dalyell, Pow. Creat.* ii. 110. pl. 15. f. 7–12.

Hab. Ponds with a muddy bottom.

Obs. The specific name is derived from the spot formed by the brown or yellow cocoon in a position behind the mouth.

2. **D.? vorax**, body round, obtuse in front, tapered backwards to a point, greenish; eyes none. Length $1\frac{1}{2}'''$; breadth $\frac{1}{2}'''$.

Planaria vorax, *Dalyell, Pow. Creat.* ii. 119. pl. 16. f. 33, 34.

Hab. Freshwater marshes.

Obs. When gorged with food resembles an inflated vesicle, tapered downwards. The food is seen to fill a capacious ovoidal stomach. There are, in the pregnant mother, from one to five brown cocoons lodged towards the posterior part.

8. MESOSTOMA*.

Mesostoma, *Oersted, Entw. Plattw.* 67.
Mesostomum, *Diesing, Syst. Helm.* i. 219. *Schultze, Naturg. der Turbell.* 52. *Schmidt, Neue Rhabdocœl.* 9.

* Dugés is the author of the name, and the genus was probably founded in 1830, not earlier than 1828. Agassiz has not mentioned it, but he has Myozostoma of much later creation.

Char. Body flattened; the mouth ventral, subcentral, encircled with a broad annular sphincter: eyes two, approximate, on the dorsum behind the apex and anterior to the mouth. Lacustrine. The ova capsulated.

1. **M. rostratum**, elongate, elliptical, acuminate, and alike at both ends, whitish and pellucid or tainted a yellowish-red; eyes reddish, approximate; mouth central; egg-capsules dark brown. Length 3‴; breadth $\frac{1}{3}$‴.

Fasciola rostrata, *Müll. Verm.* i. ii. 65.
Planaria rostrata, *Müll. Zool. Dan. Prod.* 222; *Zool. Dan.* iii. 40. tab. 105. f. 6. *Turt. Gmel.* iv. 65.
Planaria velox, *Dalyell, Planar.* 127. f. 17.
Derostoma rostratum, *Dugés in Ann. des Sc. nat.* xxi. 79. pl. 2. f. 16.
Dalyellia velox, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 438.
Mesostoma rostratum, *Oersted, Entw. Plattw.* 69. pl. 2. f. 26, 37.
Mesostomum rostratum, *Dies. Syst. Helm.* i. 219.

Hab. Ponds.

9. OPISTOMUM, *Schmidt.*

Opistomum, *Diesing, Syst. Helm.* i. 233. *Schultze, Naturg. der Turbell.* 40.

Char. Body flattish, with an anterior subterminal mouth; the œsophagus pitcher-shaped, not protrusile: eyes none. Lacustrine.

1. **Op. serpentina**, tongue-shaped, dilated and rounded in front, lanceolate behind, white or grey. Length 2‴.

Planaria serpentina, *Dalyell, Pow. Creat.* ii. 122. pl. 15. f. 20, 21.

Hab. Pools of fresh water.

Desc. "Length between one and two lines; body flattened; head obtuse, enlarging towards each side, and somewhat depressed in the centre of the front, where there seems a circular orifice, probably the mouth. The interranea, occupying much of the body, of a dark colour, and resembling curving or circular sacs. Colour of the animal white, or grey under the microscope. Motion smooth and gliding as that of other Planariæ. No eyes visible."—*Dalyell.*

10. TYPHLOPLANA, *Ehrenberg*, 1831.

Typhloplana, *Oersted, Entw. Plattw.* 71. *Dies. Syst. Helm.* i. 231.

Char. Body linear-oblong, planaroid, the oral aperture ventral, near the middle or posterior to the middle of the body: eyes none.

1. **T. fœcunda**, nearly linear or a little swollen at the middle with obtusely rounded extremities, white. Length $\frac{1}{2}$‴.

Planaria stagni, *Dalyell, Pow. Creat.* ii. 118. pl. 16. f. 30.
Planaria fœcunda, *Dalyell, ibid.* pl. 16. f. 31.

Hab. Ponds in autumn.

Obs. The very slight difference on which Dalyell has founded the distinction of his species, depends, undoubtedly, on the more or less developed state of the ova. There are twelve or fourteen of these in some individuals, which occupy nearly the whole body.

2. **T. prasina**, obtuse in front, tapering to a point behind, grass-green. Length $\frac{1}{2}'''$.

Planaria prasina, *Dalyell, Pow. Creat.* ii. 121. pl. 15. f. 15.

Hab. Ponds in autumn: gregarious.

Desc. "Length of the largest about half a line; thickness about the fifth of the length. Body roundish; head obtuse; tail tapering to a point. Colour beautifully grass-green. Motion active."—"One or two brown ova seemed to be in one or two specimens."—*Dalyell.*

3. **T.? flustræ**, body convex above, flattened below, linear-elongate, rounded and equal at both ends, white, with a dark spot on the neck. Length 2'''; breadth $\frac{1}{4}'''$.

Planaria flustræ, *Dalyell, Pow. Creat.* ii. 118. pl. 16. f. 32.

Hab. "Dwells on the *Flustra hispida*, where it is not rare in July and August."—*Dalyell.*

Obs. "Motion very swift. Apparently sustained by an invisible thread when falling through the water."—*Dalyell.*

11. CONVOLUTA.

Convoluta, *Oersted, Entw. Plattw.* 75 (1844). *Diesing, Syst. Helm.* i. 218. *Schmidt, Neue Rhabdocœl.* 5.

Char. Body flat, obtuse in front and narrowed backwards, with the margin longitudinally involute: mouth minute, ventral, anterior: eyes none. Marine.

1. **C. paradoxa.**

Planaria convoluta, *Abildgaard in Müll. Zool. Dan.* iv. 26. tab. 142. f. 4–6.
Convoluta paradoxa, *Oersted, Entw. Plattw.* 75. f. 33, 35, 36. *Dies. Syst. Helm.* i. 218. *Schmidt, Neue Rhabdocœl.* 5. pl. 1. f. 1.
Planaria macrocephala, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 437. pl. 15. f. 2 *a*, *b*.
Convoluta Johnstoni, *Dies. Syst. Helm.* i. 219.
Planaria haustrum, *Dalyell, Pow. Creat.* ii. 106. pl. 14. f. 36, 37.

Hab. Amongst confervæ between tide-marks.

Desc. Body 2''', brown, oblong, truncate in front and paler coloured, narrowed posteriorly. The anterior extremity, in some positions, is marked with a pale subcircular spot (the mouth), while, in others,

a light-coloured line runs down the centre, and the margins are folded so as to form almost a tube. There are two ventral pores, of which the anterior is oral, and the posterior genital. Very active.

The following are doubtful species of this family:—

Planaria cuneus, wedge-shaped, the front widest and truncate, greyish-brown. Length $\frac{1}{3}'''$.

Planaria cuneus, *Dalyell, Pow. Creat.* ii. 121. pl. 15. f. 16, 17.

Hab. Blackhall Pond, *Dalyell.*

Desc. "Head obtuse, the corners rounded as it advances, and the portion between them depressed. Body thick, flattened; tail acute. Colour greyish-brown. No eyes visible."—*Dalyell.* In the figure, however, a single eye in front, midway between its angles, is distinctly shown. The species is very like the *Planaria truncata* of Müller, which has four eyes. Oersted considers the latter to be synonymous with his *Vortex littoralis*, which he describes and figures with two eyes (*Entw. Plattw.* 64). See also *Dies. Syst. Helm.* i. 229.

Planoides fusca.

Planoides fusca, *Dalyell, Pow. Creat.* ii. 123. pl. 16. f. 35, 36.

Hab. The sea-shore.

Desc. "Length a line and a half; breadth and thickness nearly half the length. Body compact, solid; the anterior extremity divided horizontally into two lips, wherein is perhaps the mouth. This extremity is fashioned somewhat as a scoop by the fold of a membranaceous edge, apparently reflected on the back. A dark red internal organ is situate towards the centre of the body. Neither eyes nor marginal specks have been discovered, nor any prominent parts of external organization. Colour brownish, speckled. Motion smooth and gliding."—*Dalyell.*

Planaria hirudo, body linear, lengthened, brown, marked in front with a black point and line; two pale spots above the circular tail. Length $4'''$.

Planaria hirudo, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 437. pl. 15. f. 3. *Dies. Syst. Helm.* i. 473.

Hab. The littoral region amongst confervæ.

Desc. The body is of a uniform light brown colour excepting the two pale spots near the tail, and, when fully stretched, is of a narrow linear figure, slightly tapered in front. There is a small black dot about half a line behind the anterior end, and a dark line runs from it forward to the tip. These are not formed by an eye, or a cluster of eyes, but the line seems rather to be produced by some internal tube, and the dot by some harder, perhaps horny, substance. Very active. Motion continuous.—Seems to be nearly related to the *Pla-*

naria longiceps of Dugès (*Ann. des Sc. Nat.* xxi. 83 (1830), pl. 2. f. 21; *Dies. Syst. Helm.* i. 207).

"**Prostoma? armatum?**, translucent and gelatinous, with the cephalic points orange, and scattered irregularly.

Prostoma armatum, *Templeton in Loud. Mag. Nat. Hist.* ix. 236. f. 29 *a*. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.

Hab. "Found among *Conferva spiralis* from a drain in the bog meadows," near Belfast.—*Templeton.*

Obs. The anterior end is rounded and almost orbicular; the posterior oblong and obtuse. The eyes extend a good way down the body, which appears to be about 2 inches long; but it is probably represented considerably magnified. The species has no resemblance to the *Prostoma armatum* of Dugès; but it seems to be a member of the genus as now restricted.

Cercaria.

Cercaria, *Dalyell, Pow. Creat.* ii. 266. pl. 36. f. 9.

Hab. Fresh water.

Desc. "This is a minute animalculum, somewhat resembling a Planaria, with an annulated tapering tail. The mouth is an orifice in the centre of the anterior extremity. The body is of mutable form, the tail very extensile, when the rings are almost obliterated. Colonies of these animals, like white specks, dwell in fresh water."—*Dalyell.*

II. TERETULARIA.

Teretularia, *Blainville in Dict. des Sc. nat.* lvii. 573 (1828).
Nemertæ, *Ann. & Mag. Nat. Hist.* xiv. 33 (1844).
Cestoidina, *Oersted, Entw. Plattw.* 76 (1844). *Ray Soc. Rep. Zool.* 1847, 514.
Nemertina, *Oersted, Entw. Plattw.* 80.
Lininæ, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434 (1846).
Nemertea, *De Quatrefages, Voy. en Sicile,* ii. 95.
Nemertines, *E. Blanchard in Ann. des Sc. nat.* viii. 123 (1847).
Nemertinidæ, *T. Williams in Rep. Brit. Assoc.* 1851, 238; *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 342 (1853).
Nemertinea, *Diesing, Syst. Helm.* i. 238.
Rhynchocœla, *S. Schultze, Beitr. Turbell.* 3.

Obs. In the present state of our knowledge of this suborder it cannot be advantageously divided into families. The structure of many species has been demonstrated, but anatomists differ widely as to the function of the organs described; and hence I have avoided their nomenclature, lest error should be thus continued. It may be considered as proved that the mouth is terminal; and, in many

species, it is the orifice through which a very long proboscis can be evolved. The intestine runs undivided through the length of the body; and, it seems probable, that, in all, there is an anus. This has been demonstrated in a few species. It is found in some opening well forwards on the ventral surface, and in the posterior extremity in others. There is another, and much larger, aperture in front, behind and underneath the head. Long mistaken for the mouth, this has been usually described of late as genital, but the office is doubtful. In a few genera there are fissures on the sides of the anterior end, which are neither respiratory nor ovarian, as has been supposed.—All are marine, and are readily distinguished, in their order, by their length, which exceeds the breadth considerably, and, in many instances, "far o'ersteps the modesty of nature." The ova are laid enveloped in a jelly.

12. ASTEMMA.

Astemma, *Oersted, Entw. Plattw.* 82.

Char. Acephalous, the body filiform, without eyes or fissures on the sides of the anterior extremity: mouth inferior, approximated to the front: anus terminal?

1. **A. rufifrons**, yellowish, verging on rose-red anteriorly; the front obtuse, dark red. Length 2–3″; breadth $\frac{1}{3}$‴.

Borlasia (Nemertes) rufifrons, *Johnston in Mag. Zool. & Bot.* i. 538. pl. 18. f. 4, 5. *Dies. Syst. Helm.* i. 241.
Astemma rufifrons, *Oersted, Entw. Plattw.* 82. f. 13.
Gordius gracilis, *Dalyell, Pow. Creat.* ii. 74. pl. 9. f. 8–11.

Hab. Under stones, and amidst algæ, between tide-marks.
(*a*) Berwick Bay, *Dr. Johnston.*

2. **A. filiformis**, white or cream-yellow, thickened in front. Length 1–2″.

Planaria filiformis, *Johnston in Zool. Journ.* iv. 56.
Borlasia? filiformis, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434. pl. 15. f. 1 *a*, *b*. *Dies. Syst. Helm.* i. 242.

Hab. Under stones, in muddy places, between tide-marks.

13. CEPHALOTRIX.

Cephalotrix, *Oersted, Entw. Plattw.* 81. *Dies. Syst. Helm.* i. 246.

Char. Acephalous, the body filiform or flattish: mouth anterior, ventral: no lateral fissures: eyes two, placed in front on a parallel line.

1. **C. lineatus**, filiform, narrower at each end, dark-grey, ruddy in

front; eyes near the front, but not marginal. Length 13‴; breadth scarcely ½‴.

Vermiculus lineatus, *Dalyell, Pow. Creat.* ii. 90. pl. 10. f. 19, 20.

Hab. Coast of Scotland, *Dalyell.*

2. **C.? flustræ**, filiform, acute at both ends, pellucid, dark-grey or brownish, with a darker line in front; eyes black, placed on a pellucid portion in front. Length ½‴.

Ascaris flustræ, *Dalyell, Pow. Creat.* ii. 92. pl. 10. f. 27.

Hab. Coast of Scotland amongst Flustræ, *Dalyell.*

14. TETRASTEMMA, *Ehrenberg*, 1831.

Tetrastemma, *Oersted, Entw. Plattw.* 84. *Dies. Syst. Helm.* i. 256.

Char. Acephalous, the body linear-elongate, flattish, with four eyes placed in a quadrangle in front: mouth terminal.

1. **T. varicolor**, body rounded in front, tapered at the tail; eyes in a square; the front unspotted. Length 10–15‴; breadth 1‴.

Var. α. cream-yellow.

Var. β. punctulated with black.

Var. γ. olivaceous.

Planaria quadrioculata, *Johnston in Zool. Journ.* iv. 56.
Nemertes quadrioculata, *Johnston in Mag. Zool. & Bot.* i. 535. pl. 17. f. 4.
Prostoma quadrioculata, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.
Polia quadrioculata, *Quatrefages in Voy. en Sicile*, ii. 128. pl. 16. f. 10.
Tetrastemma varicolor, *Oersted, Entw. Plattw.* 85. f. 41–44. *Dies. Syst. Helm.* i. 257.

Hab. The shore between tide-marks.

2. **T. variegatum**, cylindrical, rather obtuse at both ends, variegated red and white, with a white line down the back. Length 8‴; breadth ½‴.

Vermiculus variegatus, *Dalyell, Pow. Creat.* ii. 91. pl. 10. f. 25, 26.

Hab. Shores of Scotland, rare, *Dalyell.*

3. **T.? algæ**, linear-elongate, widest in front, siskin-green tending to yellow or to brown. Length 4‴; breadth ½‴.

Planaria algæ, *Dalyell, Pow. Creat.* ii. 117. pl. 16. f. 24, 25.

Hab. Among marine algæ, *Dalyell.*

Obs. The motion is very swift.

15. BORLASIA*.

Borlasia, *Johnston in Mag. Zool. & Bot.* i. 536.
Nemertes, *Oersted, Entw. Plattw.* 88.

Char. Body linear-elongate, contractile, somewhat compressed, soft, even and continuous: head indistinctly defined, sometimes with a fissure on the sides: eyes four to sixteen, separate and submarginal: mouth terminal, the œsophagus unarmed with horny stylettes.

1. **B. olivacea**, linear-elongate, tapered posteriorly, of a dark olive colour with a red spot in front; eyes from four to eight. Length 3–6″; breadth 1‴.

Planaria bioculata, *Johnston in Zool. Journ.* iv. 56.
Nemertes (Borlasia) olivacea, *Johnston in Mag. Zool. & Bot.* i. 536. pl. 18. f. 1. *Oersted, Entw. Plattw.* 89. *Dies. Syst. Helm.* i. 273.
Borlasia olivacea, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434. *W. Thompson in lib. ibid.* xviii. 388.

Hab. Between tide-marks.

2. **B. octoculata**, of a uniform light reddish-brown colour; eyes six to eight, placed in opposite pairs on the sides of the head. Length 3″; breadth 1¼‴.

Planaria octoculata, *Johnston in Zool. Journ.* iv. 56.
Nemertes (Borlasia) octoculata, *Johnston in Mag. Zool. & Bot.* i. 537. pl. 18. f. 2.
Borlasia octoculata, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434. *W. Thompson in ibid.* xviii. 388.
Nemertes octoculata, *Oersted, Entw. Plattw.* 91. *Dies. Syst. Helm.* i. 276.

Hab. Under stones, between tide-marks.

3. **B. purpurea**, narrowed at both ends, of a uniform purplish-red colour, paler underneath; eyes six to eight, marginal. Length 2–3″; breadth 1‴.

Nemertes (Borlasia) purpurea, *Johnston in Mag. Zool. & Bot.* i. 537. pl. 18. f. 3. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 388.
Nemertes purpurea, *Oersted, Entw. Plattw.* 91. *Dies. Syst. Helm.* i. 275.
Borlasia purpurea, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434.

Hab. Between tide-marks, at the roots of algæ and corallines.
(*a*) Berwick Bay, *Dr. Johnston.*

4. **B. gesserensis**, linear, obtuse at the ends, greenish, sometimes

* This name was substituted for the *Lineus* of Simmons by Oken in 1815. It has been since used, in other applications, as a generic appellation, and ought, perhaps, to be discarded.

tending to brown or pale carnation; eyes six or more around the anterior margin. Length $3\frac{1}{2}''$; breadth $1'''$.

Planaria gesserensis, "elongata, viridis, pone caput rufa," *Müll. Zool. Dan.* ii. 32. tab. 64. f. 5–8. *Turt. Gmel.* iv. 67. *Bosc, Vers*, i. 308. *Lam. An. s. Vert.* iii. 179.
Notospermus gesserensis, *Dies. Syst. Helm.* i. 260.
Gordius gesserensis, *Dalyell, Pow. Creat.* ii. 73. pl. 10. f. 5.

Hab. "Under stones on the shore," *Dalyell.*

Obs. "A slit below indicates the mouth. Colour universally different shades of green; sometimes tending to brown or pale carnation. Numerous lighter narrow circles, at considerable intervals, with a minute pale speck on the side of each, environ the body, resembling faint annulations." *Dalyell.*—Oersted conjectures that this species may be the same as our *Borlasia olivacea* (Entw. Plattw. 89).

5. **B. striata**, black, with many parallel whitish or cream-coloured lines extending from one extremity to the other. Length 1–4′; breadth $1'''$.

Borlasia striata, *Rathke in Nov. Act. Nat. Curios.* xx. 231.
Nemertes striata, *Oersted, Entw. Plattw.* 92. *Dies. Syst. Helm.* i. 274.

Hab. The littoral zone.

Obs. The fragment in the collection is about 3 inches long. It closely resembles *Lineus longissimus*. The eyes are in a line, on a white space, on each side of the head, and are hence very visible. There are seven pale lines on the dorsal surface, one on each side, and three on the ventral surface.

(*a*) Falmouth, *W. C. Cocks.*

16. OMATOPLEA.

Prostoma (—), *Dugès in Ann. des Sc. nat.* xxi. 74 (1830); and *in Edin. Journ. Nat. & Geogr. Sc.* iii. 379.
Nemertes, *Johnston in Mag. Zool. & Bot.* i. 534 (1837).
Prostoma, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.
Polystemma, *Oersted, Entw. Plattw.* 92 (1844).
Omatoplea, *Diesing, Syst. Helm.* i. 248 (1850).

Char. Body linear-elongate, contractile, somewhat compressed, soft and even: head continuous with the body, indistinctly defined, with or without a shallow fissure on each side, marked with two approximate spots on the dorsal aspect, and with several eyes, scattered or clustered: mouth terminal, the œsophagus armed with horny stylettes: anus anterior?

1. **O. gracilis**, of a uniform olive colour, very long and linear, or a little narrowed posteriorly; eyes numerous, arranged on the margins of the head. Length 20″; breadth $1'''$.

Nemertes gracilis, *Johnston in Mag. Zool. & Bot.* i. 534. pl. 17. f. 1. *W. Thompson in Ann. & Mag. Nat. Hist.* vii. 482.
Prostoma gracilis, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435.
Polystemma gracile, *Oersted, Entw. Plattw.* 93.
Omatoplea gracilis, *Dies. Syst. Helm.* i. 250.

Hab. Under stones near low-water mark.

Obs. This is probably the "small and slender animal" described by Sir J. G. Dalyell, *Pow. Creat.* ii. 65. pl. 8. f. 3–6.

2. **O. rosea**, linear-elongate, rounded at both ends, of a uniform cream-colour or roseate; eyes many, in four clusters anterior to the reddish cardiac spots, the posterior clusters small. Length 3″; breadth 2‴.

Fasciola rosea, *Müll. Verm.* i. ii. 58.
Planaria rosea, *Müll. Zool. Dan. Prod.* 221; *Zool. Dan.* ii. 31. tab. 64. f. 1, 2. *W. Thompson in Ann. Nat. Hist.* xv. 321. *Turt. Gmel.* iv. 62. *Bosc, Vers*, i. 299.
Planaria lactiflorea, *Johnston in Zool. Journ.* iii. 489.
Nemertes lactiflorea, *Johnston in Mag. Zool. & Bot.* i. 535. pl. 17. f. 2, 3. *W. Thompson in Ann. & Mag. Nat. Hist.* vii. 482.
Prostoma lactiflorea, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435.
Prostoma? rosea, *Johnston in ibid.* 436.
Polystemma roseum, *Oersted, Entw. Plattw.* 92.
Omatoplea rosea, *Dies. Syst. Helm.* i. 251.
Gordius albicans, *Dalyell, Pow. Creat.* ii. 73. pl. 10. f. 5 *a*, 6.

Hab. Between tide-marks.
(*a*) Berwick Bay, *Dr. Johnston.*

3. **O. alba**, whitish, with fourteen eyes anterior to the cardiac spots, "the first four on each side near the margin of the body disposed in a line, and at equal distances from each other; considerably behind them are three at each side disposed in a triangular manner, the base towards the head of the worm." Length 2″; breadth 1‴.

Borlasia? alba, *W. Thompson's Rep. Brit. Assoc.* 1843, 271; *Ann. Nat. Hist.* xv. 320. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 434.
Omatoplea alba, *Dies. Syst. Helm.* i. 252.

Hab. Under stones between tide-marks.

4. **O. melanocephala**, linear-elongate, yellow or yellowish-green with a dark or black head; eyes four, arranged in a quadrangle. Length $1\frac{1}{2}$″; breadth $\frac{1}{2}$‴.

Nemertes melanocephala, *Johnston in Mag. Zool. & Bot.* i. 535. pl. 17. f. 4, 5. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 387. *Oersted, Entw. Plattw.* 88. *Dies. Syst. Helm.* i. 270.
Prostoma candidum? *Dugès in Ann. des Sc. nat.* xxi. 74. pl. 2. f. 3.
Prostoma melanocephala, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.
Vermiculus coluber, *Dalyell, Pow. Creat.* ii. 91. pl. 10. f. 22, 23, 24.

Hab. Under stones between tide-marks, in wet sand.

Obs. The *Tetrastemma obscurum* of Dr. M. S. Schultze is nearly allied to this species; and Schultze has proved that his species is viviparous (*Naturg. Turbell.* 62. tab. 6. f. 2–10).

(*a*) Berwick Bay, *Dr. Johnston.*

5. **O. pulchra**, linear-elliptical, rounded at both ends, of a flesh-red colour, with a series of scarlet spots along each side, or of a uniform aurora-red; eyes numerous, clustered in front. Length 1–2″; breadth 2–3‴.

Nemertes pulchra, *Johnston in Mag. Zool. & Bot.* i. 536. pl. 17. f. 6.
Prostoma pulchra, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 436.
Polystemma pulchrum, *Oersted, Entw. Plattw.* 93.
Omatoplea pulchra, *Dies. Syst. Helm.* i. 252.
Vermiculus rubens, *Dalyell, Pow. Creat.* ii. 89. pl. 10. f. 13–18.

Hab. The coralline region.

17. STYLUS.

Spinifer, *Dalyell, Pow. Creat.* ii. 77 (1853).

Char. Body linear-elongate, flattish; the head indistinctly defined, continuous with the body, oculate, and with a fissure on each side; the posterior end terminated with a cartilaginous style.

1. **S. viridis**, uniform mountain-green; the nuchal grooves very distinct; posterior extremity narrowed, with a style one-sixth the length of the body. Length 3″; breadth 1¼‴.

Gordius viridis spinifer, *Dalyell, Pow. Creat.* ii. 78. pl. 11. f. 1.

Hab. Coast of Scotland, rare, *Dalyell.*

2. **S. purpureus**, of a deep red purple colour; head somewhat spathulate, obtuse, with a fissure on each side; posterior extremity narrowed and terminated with a roughish style. Length 8″; breadth 1½‴.

Gordius purpureus spinifer, *Dalyell, Pow. Creat.* ii. 78. pl. 11. f. 2–4.

Hab. Coast of Scotland, rare.

3. **S. fragilis**, of a uniform reddish-orange colour; the front pointed. Length 3½″; breadth 2‴; anal style 6‴.

Gordius fragilis spinifer, *Dalyell, Pow. Creat.* ii. 79. pl. 11. f. 5.

Hab. Coast of Scotland, *Dalyell.*

4. **S. fasciatus**, semicylindrical, almost linear; the head obtuse, multocular; the anal style long and flexible; orange or reddish-

orange, with many white belts at regular intervals. Length 2–3″; breadth $\frac{2}{3}$‴; style 6‴.

Gordius fasciatus spinifer, *Dalyell, Pow. Creat.* ii. 80. pl. 11. f. 6-9.

Hab. Coast of Scotland, rare, *Dalyell.*

18. LINEUS.

Lineus, *Simmons in Sowerby's Brit. Misc.* 15. pl. 8 (1806). *Flem. Phil. Zool.* ii. 605.

Borlasia, *Oken in Schweig. Handb.* 591. *Blainville in Dict. des Sc. nat.* lvii. 575.

Nemertes, *Cuvier, Règn. Anim.* iii. 259.

Char. Body greatly elongated, subcylindrical, almost filiform or tapered slightly backwards: head spathulate, with a distinct fissure on each side: no eyes: mouth terminal, circular; the proboscis included but protrusile, very long and filiform, armed with horny stylettes: a large aperture underneath the head leading to the visceral cavity: intestine simple, with a small anus opening on the anterior third: "aperture of the genital organs in a small tubercle situated on the rim" of the subcervical opening.—*Blainville.*

1. **L. longissimus**, of a uniform dark purple or black colour, with three faint white longitudinal lines, smooth and glistening; head with a white line in front; subcervical aperture large and elliptical. Length 8–15′ or more; breadth 1–3‴.

Lineus longissimus, *T. W. Simmons in Sowerby's Brit. Misc.* 15. pl. 8. *Jameson in Wern. Mem.* i. 557. *Turt. Brit. Faun.* 130. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435. *Williams in Rep. Brit. Assoc.* 1851, 244. f. 64.

Gordius marinus, *Montagu in Linn. Trans.* vii. 72. *Davies in ibid.* xi. 292; reprinted in *Lond. Med. & Phys. Journ.* xxxvi. 207 (1816). *Penn. Brit. Zool.* iv. 74 (1812); not of previous editions.

Borlasia angliæ, *Schweig. Handb.* 591. *Quatrefages in Voy. en Sicile,* ii. 104. pl. 3. *Blainville in Dict. des Sc. nat.* lvii. 575, *Atlas Parentomozoaires,* tab. 1 *a–d* (opt.).

Nemertes Borlasii, *Cuv. Règn. Anim.* iii. 259. *W. Thompson in Charlesw. Mag.* ii. 21. *Griffith's Cuvier,* xii. 468. *Oersted, Entw. Plattw.* 92.

Borlasia longissimus, *Templeton in Loud. Mag. Nat. Hist.* ix. 236.

Meckelia Borlasii, *Dies. Syst. Helm.* i. 265.

Gordius maximus, *Dalyell, Pow. Creat.* ii. 63. pl. 8. f. 1, 2 & 7–10, and pl. 9. f. 1 (the intestine).

Borlasia nigra, *Byerley, Faun. Liverp.* 98.

An ascarid or planarian worm, *North Brit. Rev.* no. xliii. 38. *Kingsley's Glaucus,* 104.

Hab. The littoral zone near low water.

(*a*) Berwick Bay, *Dr. Johnston.*

(*b*) Firth of Forth, *Lieut. Thomas, R.N.*

(*c*) South Devon, *G. Montagu.*

(*d*) South Devon, *G. Montagu.*

2. **L. gracilis**, cylindrical, tapering to the anal extremity, of a dark umber colour, with a few longitudinal white lines; head continuous with the body, slightly quadrilobate; subcervical aperture small and rounded. Length 3″ or more; breadth 4‴.

Nemertes gracilis, *Goodsir in Ann. & Mag. Nat. Hist.* xv. 378 & 383. pl. 20. f. 3.
Lineus gracilis, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435.
Meckelia gracilis, *Dies. Syst. Helm.* i. 268.

Hab. The coralline region.

3. **L. lineatus**, cylindrical, tapered posteriorly, marked with faint circular wrinkles, of an olive colour, with several parallel equidistant pale lines along the body; head small, semiovate, obscurely quadrilobate, the mesial furrows indistinct, the lips white; subcervical aperture round. Length 6″; breadth 2–3‴.

Hab. The sea-shore.

Obs. There are at least six lines on the dorsal surface, and one or more on the ventral, which are sometimes almost imperceptible. The head is small, and may be almost entirely retracted.

(*a*) South Devon, *J. E. Gray.*
(*b*) Berwick Bay, *Dr. Johnston.*

4. **L. murenoides**, flattish, closely wrinkled with rugose striæ, narrowed posteriorly, of a blackish-green colour with a paler mesial line; head small, distinct, semiovate, obtuse, with a deep fissure on each side, and a shallow mesial groove on the dorsum and ventral side; rim of the mouth white; subcervical aperture large and ovate. Length 3–6″; breadth 6‴; thickness 2″.

PLATE I.

Ophiocephalus murenoides, *D. Chiaje, An. s. Vert. Nap.* pl. 62. f. 6, 7, & 13–15. *Dies. Syst. Helm.* i. 277.

Hab. The shore near low water.

Obs. Larger than *L. longissimus*, and perhaps not inferior in length. It is less brittle.

(*a*) Black-rocks, Leith, *Dr. Greville.*
(*b*) Holy Island, *Dr. Johnston.*
(*c*) Berwick Bay, *Dr. Johnston.*
(*d*) No locality.
(*e*) Falmouth, *W. C. Cocks.*

5. **L. fasciatus**, flattish, wrinkled circularly with rugose striæ, tapered posteriorly, of a yellowish-grey, with a dark fascia on each side and a mesial line on the space between them; ventral surface yellowish-grey unlineated; head spathulate, narrow, depressed, with

white lips, and a deep fissure on each side; subcervical aperture elliptical. Length 2″; breadth 3‴.

Plate II.

Hab. The sea-shore.

Obs. The lateral fasciæ are not marginal. The character is taken from a very fine specimen, but in others the fasciæ were obscurely marked.

(*a*) Falmouth, *W. C. Cocks.*
(*b*) Falmouth, *W. C. Cocks.*
(*c*) Falmouth.

6. **L. viridis,** slender, linear-elongate, narrowed behind, of a uniform green colour paler beneath; head distinct, spathulate; subcervical aperture longitudinal. Length 7–8″; breadth 1‴.

Gordius minor viridis, *Dalyell, Pow. Creat.* ii. 72. pl. 9. f. 2–7.

Hab. "Under stones on the shore within the flowing tide," *Dalyell.*
(*a*) Falmouth, *W. C. Cocks.*

7. **L. albus,** flattened, linear-elongate, rather acute at both ends, the head spathulate, with a groove on each side; of a very pale carnation or white. Length 3″; breadth 2‴.

Gordius albus, *Dalyell, Pow. Creat.* ii. 75. pl. 9. f. 12, 13.

Hab. Coast of Scotland, rare, *Dalyell.*

Obs. There is a slight red speckling on the upper surface of the head, but there are no eyes. This and the preceding species are Omatopleans in habit, but they possess the technical character of *Lineus.*

19. MECKELIA.

Meckelia, *Leuckart,* 1828, *sec. Agassiz, Nom. Zool. Verm.* 8.
Carinella, *Johnston in Loud. Mag. Nat. Hist.* vi. 232 (1833).

Char. Body linear-elongate, narrowed posteriorly, flattened, smooth; the head continuous with the body, indistinctly defined, obtusely triangulate, with a shallow fissure on each side: mouth inferior, subterminal: eyes none: anus terminal?

1. **M. annulata,** of a hyacinth-red colour, with four white lines, one down the middle of the dorsal and ventral surfaces, and one along each side, crossed with numerous lines of the same colour, which encircle the body, and mark the number of its segments; sides speckled with white dots; mouth margined with white. Length 12–30″; breadth 2‴.

Gordius annulatus, *Montagu in Linn. Trans.* vii. 74. *Turt. Brit. Faun.* 130. *Penn. Brit. Zool.* iv. 73 (1812).

Lineus annulatus, *Montagu in Mus. Leach.*
Carinella trilineata, *Johnston in Loud. Mag. Nat. Hist.* vi. 232. f. 24.
W. Thompson in Ann. & Mag. Nat. Hist. vii. 482.
Meckelia trilineata, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435.
Valencinia annulata, *Dies. Syst. Helm.* i. 244.
Gordius anguis, *Dalyell, Pow. Creat.* ii. 85. pl. 13, & pl. 10. f. 7–10.

Hab. The coralline region. Lurks in the tubes of other worms, but can form for itself a sheath of dried gluten of considerable tenacity.
(*a*) Firth of Forth, *Mr. Jenner.*
(*b*) South Devon, *G. Montagu.*
(*c*) Berwick Bay, *Dr. Johnston.*
(*d*) Berwick Bay, *Dr. Johnston.*

2. **M. tænia**, dull reddish-brown or pale red, with a white longitudinal dorsal fascia divided by a dark mesial line; ventral surface paler; head obtuse and white in front. Length 16″; breadth 1‴.

Gordius tænia = The Riband Gordius, *Dalyell, Pow. Creat.* ii. 70. pl. 10. f. 1, 2.

Hab. Coast of Scotland: "not rare, but seldom seen above four inches long," *Dalyell.* Lurks in the tubes of other worms.

Obs. "The colour of the back consists of five lines, the two exterior stripes being the broadest, having a white line within each, and the central dark line between them."—*Dalyell.*

20. SERPENTARIA.

Serpentaria, *H. D. S. Goodsir in Ann. & Mag. Nat. Hist.* xv. 377.

Char. Body linear-elongated, flat, smooth and even, acephalous and eyeless, breaking up readily in pieces; anterior end with or without fissures: mouth obscure and terminal, with a long protrusile proboscis: a subnuchal aperture.

1. **S. fragilis**, of a uniform grey colour, with a lighter-coloured thin margin; head with a small point; subnuchal aperture elliptical. Length 15″; breadth 10‴; thickness 1‴.

Serpentaria fragilis, *Goodsir in Ann. Nat. Hist.* xv. 377. pl. 20. f. 1, 2.
Meckelia serpentaria, *Dies. Syst. Helm.* i. 266.
Gordius fragilis, *Dalyell, Pow. Creat.* ii. 55. pl. 6. f. 6, 7 & 7*.

Hab. The coralline region.
(*a*) Firth of Forth, *Lieut. Thomas, R.N.*

2. **S. fusca**, of an umber-brown colour, the ventral surface almost white; anterior end obtuse, with a puckered mouth; subnuchal aperture round. Length 5–18″; breadth 1‴; thickness 1½‴.

Planaria flaccida, *Johnston in Zool. Journ.* iii. 488.
Borlasia? flaccida, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 435.
Gordius fuscus, *Dalyell, Pow. Creat.* ii. 83. pl. 12.

Hab. The coralline region.

Obs. As the specific name *flaccida* was given to this fine species under the erroneous conclusion that it was the *Planaria flaccida* of Müller, the name has been dropped for one more appropriate.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Firth of Forth, *Lieut. Thomas, R.N.*

Order II. BDELLOMORPHA.

Hirudinea planærina, *Moquin-Tandon, Monogr.* 386.
Phyllinidæ, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 438.
Bdellomorphæ, *E. Blanchard in Ann. des Sc. nat.* viii. 142 (1847), & xii. 275 (1849).

Char. Body oblong, flattened, exannulose, smooth and lubricous, acephalous: no eyes: mouth sessile, edentulous and eproboscidean, in the front margin or underneath it, and, usually, with a small suctorial disc (bothria) on each side: posterior extremity with a large circular disc or with six to eight small pedunculated discs. Intestine with an anal aperture at the posterior extremity of the body. Nervous system consisting of two lateral ganglionated cords originating in two cerebral centres placed widely apart. Monœcious or diœcious; the sexual apertures lateral and forwards. Marine parasites of fish and mollusca, infesting the outer surface, and sucking their fluids. The ova are capsulated when excluded, and are attached by a filiform peduncle. The development is unknown. No species is phosphorescent nor iridescent.

The British genera may be arranged as follows:—

Suborder I. Cryptocœla.

The intestine branched, planarian. Monœcious.

* POLYCOTYLEA. *Posterior sucker multipled.*

1. **Octobothrium.**

** MONOCOTYLEA. *Posterior sucker undivided.*

2. **Entobdella.** Sucker granulous and armed with two bicuspidate hooks.
3. **Capsala.** Sucker radiate with a central disc.
4. **Nitchia.** Sucker crenulate on the rim with a central disc.
5. **Udonella.** Sucker plain, without appendage.

Suborder II. Rhabdocœla.

The intestine undivided, cestoid. Diœcious.

6. **Malacobdella.**

II. BDELLOMORPHA.

I. CRYPTOCŒLA.

Fam. I. ONCHOBOTHRIIDÆ.

Onchobothriidæ (—), *Baird, Entoz. Brit. Mus.* 39.
Polycotyla, *Blainville in Dict. des Sc. nat.* lvii. 569 (1828).

Obs. The body is somewhat pear-shaped, but flat, and broadest at the posterior end, which is furnished with several small suckers in pairs on the margin.

1. OCTOBOTHRIUM, *Leuckart*, 1827.

Octobothrium, *Nordmann, Mikrograph. Beitr.* i. 76; *and in Lam. An. s. Vert.* 2de edit. iii. 599. *Baird in Entoz. Brit. Mus.* 40.
Diclidophora, *Diesing, Syst. Helm.* i. 417.

Char. Body somewhat oval or lanceolate, acephalous: mouth subterminal: suckers pedunculated, eight, separate, with four mobile membranous valves.

1. **O. palmatum**, lanceolate, produced in front into a short neck; suckers on a cylindrical pedicle, spreading in a palmate fashion. Length 7–12‴; breadth 2–2½‴.

Octobothrium digitatum, *Rathke in Nov. Act. Nat. Curios.* xx. 242 (1843), tab. 12. f. 12–15. *Rep. Zool. Ray Soc.* 1847, 472.
Diclidophora palmata, *Dies. Syst. Helm.* i. 417.
Octodactylus inhærens, *Dalyell, Pow. Creat.* ii. 262. pl. 36. f. 1, 2.

Hab. "Infests the gills of the ling, to which it adheres with considerable tenacity."—*Dalyell.*

Descr. "It is of a thin and flattened form, extending nine lines in extreme length, by about two in the broadest part. One extremity dilates into two portions, to the right and left, each composed of four tentacular-looking organs, a line in length. The remainder of the body tapers downwards, much like that of the common Planariæ. A longitudinal internal cavity seems to consist of a larger and a smaller compartment; besides which numerous pinnate organs also occupy the substance of the body. The colour of the whole is bluish-grey. The body being remarkably thin, soft, and flexible, it applies closely to its site, with some adhesion; and the two anterior portions clasp the rib of the gills in their fold. They have little other motion than slightly extending and contracting."—*Dalyell.*

Fam. II. CAPSALIDÆ.

Tristomiens, *E. Blanchard in Ann. des Sc. nat.* viii. 321 (1847).
Capsalidæ, *Baird, Entoz. Brit. Mus.* 41.

Obs. The mouth is inferior and not terminal. On each side, and a little above it, there is a small sucker (bothria); and on the hinder extremity a large sucker with a ventral attachment and aspect. The cerebral ganglions are placed a little in advance of the oral aperture.

2. ENTOBDELLA.

Entobdella, *Blainville in Lam. An. s. Vert.* v. 295 (1818).
Phylline, *Lam. An. s. Vert.* v. 295. *Baer in Nov. Act. Curios.* xiii. 674. *Moquin-Tandon, Monogr.* 391. *Diesing, Syst. Helm.* i. 426.
Epibdella, *Blainville in Dict. des Sc. nat.* xlvii. 259, & lvii. 567.

Char. Body obovate; the front subtriangular, with two oblique marginal linear bothria; the mouth inferior, with a semicircular thickened rim: sucker sessile, hemispherical, with a reflected margin, the concave surface rough with rowed granules, and the centre armed with two horny four-hooked clasps.

1. E. hippoglossi.

Tertia pediculorum species, *Bast. Opusc. Subs.* II. ii. 99. tab. 8. f. 11 (1765).
Hirudo hippoglossi, *Müll. Zool. Dan. Prod.* 220. no. 2669; *Zool. Dan.* ii. 18. tab. 54. f. 1–4; copied in *Encyclop. Meth.* pl. 52. f. 11–14. *Fabr. Faun. Grœnl.* 322. no. 302. f. 8. *Turt. Gmel.* iv. 71. *Baer in Nov. Act. Acad. Cæs. Leop. Nat. Cur.* xiii. 678. pl. 32. f. 5, 6.
Phylline hippoglossi, *Lam. An. s. Vert.* v. 295; 2de edit. v. 526. *Stark, Elem.* ii. 142. *Johnston in Ann. Nat. Hist.* i. 431. pl. 15. f. 1–3. *Ray Soc. Rep. Zool.* 1847, 472. *W. Thompson in Ann. & Mag. Nat. Hist.* vii. 482. *Gould, Invert. Massachus.* 343. *Moq.-Tandon, Monogr.* 392. *Dies. Syst. Helm.* i. 426.
La Sangsue de l'Hippoglosse, *Blainville in Dict. des Sc. nat.* xlvii. 269.
Epibdella hippoglossi, *Blainville in lib. cit.* lvii. 567, *atlas*, f. 8. *Egidh, Blutelg.* 134. f. 79.
Tristoma hamatum, *Rathke in Nov. Act. Acad. Cæs. Leop.* xx. 238. tab. 12. f. 9–11. *Ray Soc. Rep. Zool.* 1847, 472.

Hab. The parasite of the Holibut (*Hippoglossus vulgaris*).

Obs. Body ovate, flat, thin, lubricous and semitransparent, so as to permit the vessels and interranea to be seen distinctly; and of these the most conspicuous are the testes, which form two large round white spots in the centre of the body. The sucker is very large and subpedicellate, rough, with tubercles excepting on the upper side which is smooth; and it is also armed with two pairs of elongate spinous teeth so placed as to form by their union a sort of oblong or horse-shoe-shaped space running from the inferior margin to the centre of the disc.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Ireland, *Brit. Mus.*
(*c*) No locality nor name attached.

3. CAPSALA, *Bosc*, 1811.

Capsala, *Blainville in Dict. des Sc. nat.* lvii. 568. *Moquin-Tandon, Monogr.* 395.
Tristome, *Cuv. Règn. Anim.* iii. 265. *Baer in Nov. Act. Curios.* xiii. 675.
Tristomum, *Diesing, Syst. Helm.* i. 428.

Char. Body suborbicular or oblong, flat: head with two suborbicular marginal or frontal bothria: mouth anterior, between the bothria: sucker inferior, sessile, saucer-like, seven-radiated, with a small central disc: female aperture below the mouth: male organ filiform, behind the vulva on the left side of the body.

1. **C. rudolphiana**, suborbicular, emarginate behind, foveolate underneath; bothria frontal, suborbicular; sucker with a membranous plaited margin. Length 5–9‴; breadth 5–10‴.

Tristoma coccineum, *Rudolphi, Syn. Entoz.* 123 & 428. tab. 1. f. 7, 8. *Yarrell, Brit. Fish.* ii. 353; 2nd edit. ii. 468, vign. *W. Thompson in Ann. & Mag. Nat. Hist.* xx. 175.
Phylline coccinea, *Schweig. Handb.* 474.
Capsala coccinea, *Blainv. Dict. des Sc. nat.* lvii. 569, *Atlas*, f. 11. *Moq.-Tandon, Monogr.* 396.
Tristoma molæ, *E. Blanchard in Ann. des Sc. nat.* viii. 326 (1847).
Tristomum rudolphianum, *Dies. Syst. Helm.* i. 429.

Hab. On the short Sun-fish (*Orthagoriscus mola*), not confined to the gills, on which I have not found them. They adhere to every part of the skin.

4. NITSCHIA.

Nitzchia, *Baer in Nov. Act. Curios.* xiii. 675 (1826). *Diesing, Syst. Helm.* i. 425. *Blainville in Dict. des Sc. nat.* lvii. 567.
Nitschia, *Moq.-Tandon, Monogr. Hirud.* 393.

Char. Body oblong, flat: head continuous with the body and furnished with two oblique linear marginal bothria: mouth between the bothria, frontal: sucker sessile, cupped, with an inflected crenulate rim and a small central disc: female aperture beneath the mouth: penis filiform, below the vulva.

1. **N. elegans.**

Nitzchia elegans, *Baer in Nov. Act. Nat. Curios.* xiii. 660. tab. 32. f. 1–4. *Dies. Syst. Helm.* i. 426. *Blainv. lib. cit.* lvii. 568.
Capsala elongata, *Nordmann in Lam. An. s. Vert.* 2de édit. iii. 602. *Baird, Entoz. Brit. Mus.* 42.

Nitschia elongata, *Moq.-Tandon, Monogr.* 394.
Tristoma sturionis, *E. Blanchard in Ann. des Sc. nat.* viii. 329 (1847).

Hab. The gills of the Sturgeon. Found on *Acipenser acutirostris*, Parn., taken on the coast of Scotland by Dr. Melville.

5. UDONELLA.

Udonella, *Johnston in Loud. Mag. Nat. Hist.* viii. 498. *Dies. Syst. Helm.* i. 427.

Char. Body subcylindrical: head cuneate and truncate, with two oblique marginal oblong bothria: mouth between the bothria, with a short bell-shaped proboscis encircled at the orifice with a double series of papillæ: sucker terminal, sessile, urceolate: sexual apertures ventral and forwards.

1. U. caligorum.

Udonella caligorum, *Johnston in Loud. Mag. Nat. Hist.* viii. 497. f. 45. *W. Thompson in Ann. & Mag. Nat. Hist.* xv. 320. *Dies. Syst. Helm.* i. 427. *Dalyell, Pow. Creat.* ii. 13, & i. pl. 66. f. 11.

Hab. Parasitical on the Caligus of the Holibut.

II. RHABDOCŒLA.

Fam. III. MALACOBDELLIDÆ.

Bdellomorphes, *E. Blanchard in Ann. des Sc. nat.* xii. 275 (1849).

Char. Body flattened, exannulose, smooth, with a circular saucer-shaped sucker at the posterior extremity. Mouth anterior, marginal, edentulous, minutely papillose: intestinal canal simple, with a vent above the sucker. There is no heart, but the circulating system is well developed and copiously ramified. The respiration is cutaneous. The nervous system is bilateral. The sexes are separate; and the female is oviparous.

6. MALACOBDELLA.

Malacobdella, *Blainville in Dict. des Sc. nat.* xlvii. 270; *ibid.* lvii. 566; *and in Cuv. Règn. Anim.* iii. 217. *Blanchard in Ann. des Sc. nat.* iv. 373 (1845), *and* viii. 142 (1847). *Diesing, Syst. Helm.* i. 445.
Xenistum, *E. Blanchard in lib. cit.* 142.

Char. Body oval or oblong: sexual orifices towards the front: mouth in a frontal emargination, villous internally: sucker attached at the centre, unarmed, large.

1. **M. grossa**, ovate, oblong, roughish with minute granules, flesh-colour; front emarginate; intestine flexuous throughout. Length 1–2″; breadth 6‴.

Hirudo grossa, *Müll. Zool. Dan. Prod.* no. 2668; *Zool. Dan.* i. 21. tab. 21. f. 1–5; *copied in Encyclop. Méthod.* pl. 52. f. 6–10. *Turt. Gmel.* iv. 70. *Johnston's Introd. Conchol.* 381.
Phylline grossa, *Johnston in Loud. Mag. Nat. Hist.* vii. 587. f. 67.
Malacobdella grossa, *Moq.-Tandon, Monogr.* 388. *Blanchard in Ann. des Sc. nat.* viii. 143 (1847). *Dies. Syst. Helm.* i. 445.
Monostoma Cyprinæ, *Mus. Leach.*

Hab. In lamellibranchiate mollusca from the coralline region: *e. g. Artemis exoleta, Cyprina islandica,* and *Cardium echinatum.*
(*a*) In *Cyprina islandica,* Plymouth.—*Leach.*

2. **M. Valenciennæi**, oblong, transparent, yellowish-white; the front subsinuate; the intestine flexuous on the lower half only. Length 16‴; breadth 3–4‴.

Hirudo grossa, *Blainville in Dict. des Sc. nat.* xlvii. 270.
Malacobdella grossa, *Blainv. lib. cit.* lvii. 566, *Atlas,* f. 9.
Xenistum Valenciennæi, *Blanchard in Ann. des Sc. nat.* iv. 365 (1845).
Malacobdella Valenciennæi, *Moq.-Tandon, Monogr.* 389. *Blanchard in Ann. des Sc. nat.* iv. 373 (1845), viii. 143 (1847), *and* xii. 276. pl. 5. *Cuv. Règ. Anim. illustr. Annel.* pl. 23. f. 5. *Diesing, Syst. Helm.* i. 445.

Hab. In *Mya truncata,* between the cloak and the body of its tenant. Firth of Forth.

Obs. In the 'Fauna of Liverpool,' Mr. Byerley mentions "a marine suctorial species found between the branchial leaflets of *Pholas crispata,*" p. 99. This was probably *M. Valenciennæi.*
(*a*) Two specimens. They were in the same vial with the preceding.

3. **M. anceps**, oblong, the front truncate, with two reddish spots on the vertex; intestine flexuous.

Hirudo anceps, *Dalyell, Pow. Creat.* ii. 11. pl. 1. f. 22–25.

Hab. Scottish seas, *Dalyell.*

Desc. "Length, when extended, nine lines, breadth three; body tapering slightly to the anterior extremity, which is obtuse. The posterior extremity terminates in a sucker of considerable diameter, colour wax-yellow. A waving intestine down the centre is perceptible. Two dull red specks are indistinctly seen towards the anterior. The whole animal is of a very gelatinous aspect."—*Dalyell.*

The *Monopus medusicola* of Gosse (*Ann. & Mag. N. Hist.* ser. 2. xv. 277. pl. 8 B) is not a Leech, but a Trematode worm, allied to *Distoma.*

Order III. BDELLIDEA.

Hirudo, *Linn. Syst.* x. 649. *Dalyell, Pow. Creat.* ii. chap. 1.
Les Sangsues, *Cuv. Règ. Anim.* iii. 212.
Annelides Hirudineæ, *Savigny, Syst. des Annel.* 6 & 105.
Hirudines, *Savigny, Syst.* 108.
Sanguisugaires, *Blainville in Dict. des Sc. nat.* xlvii. 205 (1827).
Hirudinea, *Blainville in lib. cit.* xlvii. 205. *Latr. Fam. Nat.* 246. *Moq.-Tandon, Monogr.* 279.
Les Hirudinées, *Lam. An. s. Vert.* v. 289.
Hirudina, *Macleay in Murchison's Silurian System,* ii. 699 (1839); *and in Ann. Nat. Hist.* iv. 385.
Bdellidea, *Blainville sec. Diesing, Syst. Helm.* i. 415.
Myzocephala monocotyla seu Bdellaires, *Blainville in Dict. des Sc. nat.* lvii. 530, 555 & 556.
Annelides suceurs, *Milne-Edwards, Elem. Zool.* ii. 225.
Annelida suctoria, *Jones, Anim. Kingd.* 189.
Annelides suceuses, *Audouin & M.-Edwards, Litt. de la France,* ii. 50.
Discophora, *Grube, Fam. Annelid.* 28.

Char. Body elongated, depressed or subcylindrical, annular, the rings narrow, defined by continuous lines, apodous, determinate in number; the anterior conformed into a more or less distinct sucker, with the mouth in its centre or on its ventral side; and the posterior forming a terminal circular cupped disc: mouth sessile, with or without denticles or jaws, or with a proboscis: eyes sometimes none, more commonly there are from two to ten on the anterior rings in pairs, sessile and simple: sexual orifices single, anterior and ventral simple pores in the median line: vent opening on the dorsum above the posterior disc. Nervous system a single median ganglionated chain. No special organs of taste, smell, or hearing; the touch exquisite, diffused, but perhaps more concentrated in the discs. Circulation in vessels, the blood red or almost colourless. No special organs of respiration: intestinal canal chambered, sacculated, and furnished with cæcal appendages more or less developed: hermaphroditical. In a more or less strict sense, the Bdellidea are all parasitical and aquatic. They suck the juices of other animals, but a few are zoophagous. They do not reproduce amputated portions of the body. They are oviparous, and protect the ova in horny capsules or in fibro-gelatinous cocoons. The young do not undergo a metamorphosis, and attain maturity slowly. None are phospho-

rescent; and the skin rarely and feebly reflects the light. Progression is effected by alternate fixations and loosenings of the suckers, and by corresponding contractions and extensions of the intermediate segments or rings. Many species can also swim in the water by undulatory eel-like movements of the extended body.

The British genera may be arranged as follows:—

Tribe I. Hirudinacea, *Grube.*

Mouth without a protrusile proboscis.

* *Oral sucker entire, exannular, strictured at its origin, with the mouth at the bottom of the cup on its ventral side.*

Family I. **BRANCHELLIDÆ.** Branchiæform lobes on each side of the segments.

1. **Branchellion.** The only genus.

Family II. **PISCICOLIDÆ.** Segments not marginated.

2. **Pontobdella.** Segments distinct: eyes none.
3. **Piscicola.** Segments indistinct: eyes on the sucker.

** *Oral sucker incomplete, continuous with the body, and formed by a moulding of the anterior rings.*

Family III. **NEPHELIDÆ.** Anus large: the gullet long.

4. **Nephelis.** Mouth edentulous: gullet with three plaits: eyes eight.
5. **Trocheta.** Jaws rudimentary, not denticulated: gullet with three plaits: eyes eight.
6. **Aulastoma.** Jaws three, minute: gullet with twelve plaits: eyes ten.

Family IV. **HIRUDINIDÆ.** Anus very small: the gullet short.

7. **Hæmopsis.** Jaws three, not compressed, sparingly and bluntly denticulate: eyes ten.
8. **Hirudo.** Jaws three, compressed, multidentate: eyes ten.

Tribe II. Clepsinea, *Grube.*

Mouth with a protrusile proboscis.

Family V. **GLOSSOPORIDÆ.** The only family.

9. **Glossophonia.** The only genus.

III. BDELLIDEA.

I. HIRUDINACEA.

Fam. I. BRANCHELLIDÆ.

Sangsues branchelliennes, *Savigny, Syst. Annelid.* 106.

Obs. The foliaceous lobes which margin and thicken the sides were described by Savigny as branchial organs, but Blainville assures us that they are not so. De Quatrefages has proved that they are branchial in a certain sense,—aërating the lymph and chyle previous to their admixture with the blood.

1. BRANCHELLION, *Savigny*, 1817.

Branchellion, *Savigny, Syst. Annel.* 109. *Lam. Anim. s. Vert.* v. 529. 2de édit. *Cuv. Règn. Anim.* iii. 216. *Moq.-Tandon, Monogr.* 281.
Branchiobdella, *Blainville in Dict. des Sc. nat.* lvii. 556.

Char. Body elongate, flattened, coriaceous, annulated and margined with a series of foliaceous lobes along each side, commencing on the fourteenth segment: oral sucker with a ventral aspect, small, deeply cupped, with a broad entire rim, constricted at its insertion, and supported on a long cylindrical smooth neck issuing abruptly from the body: mouth with three obsolete jaws: anal sucker larger, cupped, terminal, with a ventral aspect, without a rim: vent very small, round: sexual male orifice at the base of the neck and anterior to the female, which is between the fifteenth and sixteenth rings.

1. **Br. torpedinis**, foliaceous appendages in five semicircular lobes.

Branchellion torpedinis, *Savig. Syst. Annel.* 109. *Risso, l'Europ. Mérid.* iv. 432. *Moq.-Tandon, Monogr.* 282. pl. 1. f. 1–10. *M.-Edwards in Lam. An. s. Vert.* 2nde édit. v. 530. *Cuv. Règn. Anim. illustr.* 51. pl. 23. f. 3.
La Sangsue de Rodolphi, *Blainv. Monogr. Hirud.* 39.
Branchiobdella torpedinis, *Blainville in Dict. des Sc. nat.* lvii. 556; *Atlas, Hirud.* f. 1.
Branchiobdella Rudolphii, *Diesing, Syst. Helm.* i. 443.
Le Branchellion, *Quatrefages, Souv. d'un Naturaliste*, ii. 326 & 527.

Hab. On the Electric-Rays (Torpedo).

Obs. The species is described as being of a dark-brown dotted with yellowish-white, but, in spirits, it becomes of a uniform sienna-yellow colour. The body is flattened; the dorsal surface a little

convex, obscurely annulate and smooth; the ventral surface flat, crossed with thirty-two raised equidistant plaits terminating by an enlargement on each side in the lateral appendages. These are foliaceous, with thin undulating broad lobes, veined with branching vessels so that they have the appearance of being branchial. The oral sucker is small, without eyes. The rings of the neck, which tapers from its origin upwards, are obsolete, and there is a sexual aperture at its base. The first segment of the body is rounded and circular. Anal sucker twice as large as the oral, with a granulous disc. Length 2″; breadth 4‴.

(*a*) English: with Soles, *J. E. Gray*.

Fam. II. PISCICOLIDÆ.

Sangsues albioniennes, *Savigny, Syst. Annel.* 106.
Hirudinea albionea, *Moq.-Tandon, Monogr.* 280.

Obs. The parasites of fish on whose juices they feed; and, as the mouth is edentulous, the fluid must be sucked through or from the soft skin. The intestine has no sacculated appendages. The blood is reddish or yellowish only. Some species communicate a strong tincture to spirits. The ova are included in horny capsules, which are attached to foreign bodies.

2. PONTOBDELLA, *Leach*, 1814.

Pontobdella, *Leach in Supp. Encyclop. Brit.* i. 451. *Lam. Anim. s. Vert.* v. 293. *Blainville in Dict. des Sc. nat.* xlvii. 241, & lvii. 557. *Moq.-Tandon, Monogr.* 284. *Diesing, Syst. Helm.* i. 436.
Albione, *Savigny, Syst. des Annel.* 106, 110.

Char. Body elongate-cylindrical, narrowed forwards, coriaceous, distinctly and unequally annulated, with a complete circular sucker at each extremity: oral sucker of one segment, separate from the body, cupped, with an entire margin and an interior adnate cup, at the base of which, a little to the ventral side, is the small mouth furnished with three obsolete denticles: anal sucker cupped, terminal; the anus a minute pore on the back behind it: sexual pores anterior, the male aperture posterior to the female. Parasites of sea fish. The egg-capsules are erect, attached by a broad base; and each capsule contains a single fœtus.

* *With a clitellus formed of eight unequal narrower rings, and where the sexual pores open outwardly.*

1. **P. muricata**, rings encircled with a series of subacute warts spinulose on the top; segment rings narrow, with small warts; oral sucker with three marginal tubercles on each side. Length 4″.

Sangsue de mer, *Rondel. Poiss.* ii. 77. fig.
Hirudo marina, *Gesner, Hist. Pisc. et Aquatil.* iv. 513. fig. *Aldrov. de Insect.* lib. vii. 733. *Johnst. de Insect.* lib. iv. 206. tab. 25.
Insectum marinum hirudini affine cornubiense, *Raii Hist. Insect.* 4.
Hirudo muricata, *Linn. Faun. Suec.* 2nd edit. 506; *Syst.* 1080; *Mus. Adolph. Freder.* 93. tab. 8. f. 3, with the name *Hirudo marina.* [This is the original of the "horned" figure in *Pennant*, &c.] *Penn. Brit. Zool.* iv. 38. pl. 20. f. 14; edit. 1812, iv. 71. pl. 21. f. 4. *Turt. Gmel.* iv. 71; *Brit. Faun.* 130. *Stew. Elem.* ii. 357. *Johnson on the Med. Leech*, 38. *Dalyell in Edin. New Phil. Journ.* 1827, 391. *Grant in Edin. Journ. of Science*, no. 14. *Dalyell, Pow. Creat.* ii. 3. pl. 1. f. 1–15.
Pontobdella spinulosa, *Leach, Zool. Misc.* ii. tab. 65; *and in Supp. Encyclop. Brit.* i. 451. pl. 26. *Lam. An. s. Vert.* v. 294; 2de édit. v. 525. *Stark, Elem.* ii. 142. *Egidy, Bluteg.* 106. *Dies. Syst. Helm.* i. 437.
Pontobdella muricata, *Lam. Anim. s. Vert.* v. 293; 2de édit. v. 524. *Stark, Elem.* ii. 142. *Templeton in Loud. Mag. Nat. Hist.* ix. 236. *Risso, l'Europ. Mérid.* iv. 432. *Grube, Actin.* 60. *Egidy, Bluteg.* 106. tab. 4. f. 71. *Moq.-Tandon, Monogr.* 285. pl. 1. f. 11, 12; pl. 2. f. 1–9.
Albione muricata, *Savigny, Syst. Annel.* 110. *D. Chiaje, An. s. Vert. Nap.* i. 49. *Cuv. Règ. An. illustr.* 51. pl. 23. f. 2.
La Sangsue épineuse, *Blainv. Dict. des Sc. nat.* xlvii. 241.
La S. spinuleuse, *Blainv. ibid.* 242.

Hab. On the Skate, frequent.
(*a*) Firth of Forth, *Mus. Leach.*
(*b*) Berwick Bay, *Dr. Johnston.*
(*c*) Disp.? The locality is illegible.
(*d*) Falmouth, *J. Cranch* (P. areolata).
(*e*) Falmouth, *J. Cranch.*
(*f*) Sandgate, Kent, *Mus. Leach.*
(*g*) Sandgate, *Rev. Ger. Smith.*
(*h*) Hastings.
(*i*) No label.
(*j*) Weymouth Bay.
(*k*) Weymouth, *W. Thompson.*

2. **P. verrucata**, rings encircled with depressed or mammiform warts generally confluent and without a spinulose apex; segment rings less distinct, narrow; rim of the oral sucker without tubercles. Length 4″.

Hirudo piscium, *Bast. Opusc. Subs.* i. 82. tab. 10. f. 2.
Hirudo verrucosa, *Fleming in Wern. Mem.* ii. 245. *Johnson on the Med. Leech*, 39.
Pontobdella verrucata, *Grube, Actin.* 60. *Moq.-Tandon, Monogr.* 288. pl. 2. f. 10 & 12. *Egidy, Bluteg.* 106. *Dies. Syst. Helm.* i. 438.
Albione verrucata, *Savig. Syst. Annel.* 111.
La Sangsue verruqueuse, *Blainv. Dict. cit.* xlvii. 242.

Hab. On the Skate, frequent; and hence our fishermen call this and the preceding, the Skate-leech or Skate-sucker.

Obs. I am inclined to believe that *P. muricata* and *verrucata* are distinct species, to be distinguished by the assigned characters in general readily, although I have seen a few specimens where some hesitation might exist as to their specific designation. When alive both are of a dull green colour. There are twelve rings between the oral sucker and the clitellus, and three of these are more prominent than the intervening ones. The clitellus is composed of eight unequal narrower rings. Behind the clitellus there are about forty-six rings, divided into sets of three each by the intervention of a narrower and less papillose ring. Sometimes from distension this division into rings becomes obliterated, or nearly so.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) South coast of Devon, *G. Montagu.*
(*c*) Abergsteyth, *Rev. J. Henslow.*
(*d*) Falmouth, *J. Cranch.*
(*e*) No locality.

3. **P. areolata**, body narrowed forwards into a taper annulated neck, smooth and even, indistinctly or obsoletely ringed; oral sucker small, one-half the size of the anal, the rim plain. Length 3″; breadth 5‴.

Pontobdella areolata, *Leach in Brit. Mus. Coll.* *Blainv. Dict. des Sc. nat.* lvii. 557. *Moq.-Tandon, Monogr.* 290. pl. 2. f. 12. *Dies. Syst. Helm.* i. 439.
La Sangsue aréolée, *Blainv. Dict. cit.* xlvii. 242; *Monogr.* 40.

Hab. The English coast: rare.

Obs. The specimen labelled "*P. areolata*" in the Mus. Coll. is one of *P. muricata*, and the specimen which I presume to be *P. areolata* has no name affixed to it. It is in bad condition, but from its flexibility and flatness it may be inferred that the leech is soft when living. It is at once seen that it differs from every variety of *P. verrucata* by the gradual manner in which the body tapers from below the middle to the head. There are no distinct rings excepting on the neck. Over the body generally there is an appearance as it were of subcutaneous depressed warts which give, in some partial spots, the areolated appearance whence the name has been derived. The colour, in spirits, is a dull yellowish-grey. It seems a distinct species.

(*a*) Plymouth Sound, *Charles Prideaux.*

** *Segments and rings subequal, smooth: no clitellus.*

4. **P. lævis**, skin smooth, obsoletely annulated; body narrowed forwards; anal sucker comparatively small, less than the oral or subequal. Length 4–6″.

Hirudo (Pontobdella) lævis, *Blainv. Dict. des Sc. nat.* xlvii. 243, *Atlas Sangsues*, f. 3.

Pontobdella lævis, *Blainv. Dict. cit.* lvii. 557. *Egidy, Bluteg.* 106. pl. 4. f. 72 (cop. from *Blainv.*). *Moq.-Tandon, Monogr.* 290. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 391. *Dies. Syst. Helm.* i. 439.

Hab. The coralline region: rare.

Obs. Tinctures the spirits a beautiful scarlet colour. *P. muricata*, on the contrary, imparts an intense green colour to the fluid.

5. **P. littoralis**, body naked, wrinkled with the narrow rings, chestnut-brown or variegated with rufous; suckers with an oblique rim. Length 1–2″; breadth 2–3‴.

Piscicola marina, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 441. pl. 15. f. 4–6? *W. Thompson in Rep. Irish Invert.* 272.
Ichthiobdella marina, *Dies. Syst. Helm.* i. 442.
Hirudo vittata, *Dalyell, Pow. Creat.* ii. 9. pl. 1. f. 16–21.

Hab. Parasitical on littoral fish.

Obs. In spirits the colour becomes a uniform wood-brown. The rings are obscurely marked, but are made evident by the series of minute crenulations on the margins. The capsules are sessile and nearly hemispherical. The specimen mentioned by Sir J. G. Dalyell, which was 8 or 9 inches long, belonged probably to *P. lævis*.

(*a*) Berwick Bay, on *Aspidophorus cataphractus*, Dr. Johnston.

6. **P. campanulata**, dark olive speckled with yellow, smooth, exannular; suckers pale, the anal very large comparatively. Length 13‴; breadth $\frac{1}{2}$‴.

Hirudo campanulata, *Dalyell, Pow. Creat.* ii. 12. pl. 1. f. 26, 27.

Hab. Coast of Scotland, *Dalyell.*

3. PISCICOLA*.

Piscicola, *Blainville in Lam. An. s. Vert.* v. 294 (1818); 2de édit. v. 525; *in Dict. des Sc. nat.* xlvii. 244. *Muell. de Hirud. Berol.* 15. *Moq.-Tandon, Monogr.* 293.
Ichthyobdella, *Blainville in Dict. des Sc. nat.* xlvii. 244, & lvii. 557. *Dies. Syst. Helm.* i. 439.
Hæmocharis, *Savig. Syst. des Annel.* 106 & 111; *Ann. & Mag. Nat. Hist.* ix. 11. *Cuv. Règn. Anim.* iii. 215.

Char. Body elongate, subcylindrical, a little narrowed forwards, indistinctly annulated: oral sucker saucer-like, excentrically attached, strictured at its insertion: mouth small, inferior, edentulous: eyes in pairs on the dorsal side of the sucker: anal sucker larger than the oral, excentrically attached, somewhat elliptical, with a simple

* Grube places this genus in the tribe Clepsinea.

thin margin: male orifice at the base of the neck, the female posterior to it: vent very small, and scarcely visible. Lacustrine.

1. **P. geometra**, eyes eight, in pairs congregate on a fuscous spot; anal sucker rayed with fuscous, and marked between the rays with eight blackish dots. Length 8–12‴; breadth 1–2‴.

Hirudo teres extremitatibus dilatatis, *Linn. Faun. Suec.* 365.
Hirudo geometra, *Linn. Syst.* x. 650; xii. 1080; *Faun. Suec.* 2nd edit. 506. *Penn. Brit. Zool.* iv. 38. pl. 20. f. 13. *Turt. Gmel.* iv. 70; *Brit. Faun.* 129. *Johnson on Med. Leech*, 35. *Brightwell in Ann. & Mag. Nat. Hist.* ix. 11. pl. 1. f. 1–8.
The Great-tailed Leech, *Hill, Hist. Anim.* iii. 17.
Hirudo piscium, *Rösel, Insect.* iii. 199. tab. 32. f. 1–8. *Müll. Verm.* i. ii. 43; *Zool. Dan. Prod.* 220. *Penn. Brit. Zool.* iv. 70 (1812), pl. 21. f. 3. *Stew. Elem.* ii. 357. *Ray Soc. Rep.* 1845, 286.
Piscicola piscium, *Lam. An. s. Vert.* v. 294; 2de édit. v. 525. *Stark, Elem.* ii. 142. *Moq.-Tandon, Monogr.* 294.
Hæmocharis piscium, *Savig. Syst. Annel.* 111.
Ichthyobdella geometra, *Blainville in Dict. des Sc. nat.* xlvii. 244, & lvii. 558. *Gervais in Ann. des Sc. nat.* vii. 56 (1837). *Dies. Syst. Helm.* i. 440.
Ichthyobdella piscium, *Egidy, Bluteg.* 107. pl. 4. f. 73.
Piscicola geometra, *Flem. Phil. Zool.* ii. 604. *W. Thompson in Ann. Nat. Hist.* xiii. 437.

Hab. In lakes, infesting the fish.

Obs. M. Gervais asserts that the ocular points on the anterior sucker, and the specks on the posterior sucker, are identical in structure!

2. **P. percæ**, anal sucker with fourteen dusky rays and as many black dots disposed circularly. Length 1″; breadth ¾‴.

Ichthyobdella percæ, *R. Templeton in Loud. Mag. Nat. Hist.* ix. 236. f. 28. *Dies. Syst. Helm.* i. 442.
Piscicola percæ, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 441.

Hab. "Found on a perch brought from Lough Neagh by Miss Templeton."

Fam. III. NEPHELIDÆ.

Obs. The rudimentary condition of the jaws disables the members of this family from piercing the skin of animals. They are eminently carnivorous, preying on worms, mollusca, and insect larvæ, which they swallow entire. The intestinal canal follows the character which the nature of the food indicates;—it is simple, without lateral prominent lobes; but in *Aulostoma* the stomach shows a tendency to be sacculated, and has a pair of long appendages. The species are lacustrine, but they leave the water often, and live under

stones on the wet shore. They swim with ease, and crawl in the usual manner along the ground. They deposit their eggs in multiparous capsules.

4. NEPHELIS.

Heluo, *Oken in Schweigg. Handb.* 593.
Nephelis, *Savig. Syst. Annel.* 107 & 117. *Lam. An. s. Vert.* 2de édit. v. 527. *Moq.-Tandon, Monogr.* 301. *Dies. Syst. Helm.* i. 456.
Erpobdella, *Blainville in Lam. An. s. Vert.* v. 296; *Dict. des Sc. nat.* xlvii. 258, & lvii. 563. *Mueller, Hirud. Berol.* 11.

Char. Body linear-elongate, widening a little and insensibly backwards, flattened, of numerous equal rather indistinctly defined rings, acephalous: mouth large, with a semielliptical protrusile lip formed of three segments constituting a sort of sucker: eyes 8, in two subarcuate series on the first and third rings: sexual orifices, the male between the 31st and 32nd, and the female between the 34th and 35th rings. Anal sucker obliquely terminal, centrally attached, of medium size: vent large, semilunar. Ova in a horny capsule affixed horizontally, and cemented to subaquatic bodies.

1. N. octoculata.

Hirudo depressa nigra abdomine subcinereo, *Linn. Faun. Suec.* 365. no. 1273.
Hirudo octoculata, *Linn. Syst.* x. 649, xii. 1079; *Faun. Suec.* 2nd edit. 506. *Blumenb. Elem. Nat. Hist.* 244. *Turt. Gmel.* iv. 69; *Brit. Faun.* 129. *Penn. Brit. Zool.* iv. 71 (1812). *Willdenow, Princip. Bot.* 142.
Hirudo vulgaris, *Müll. Verm.* i. ii. 40; *Zool. Dan. Prod.* 220. no. 2661. *Stew. Elem.* ii. 356. *Johnson on Medic. Leech,* 33; *Furth. Obs.* 29, with a plate.
Erpobdella vulgaris, *Lam. An. s. Vert.* v. 296; 2de édit. v. 528. *Blainville in Dict. des Sc. nat.* xlvii. 259, lvii. 564. *D. Chiaje, An. s. Vert. Nap.* i. 49. *Egidy, Bluteg.* 134. f. 64.
Nephelis tessellata, *Savig. Syst.* 117.
Nondescript Leech, *Ure's Rutherglen,* 236.
La Nephelis vulgaire, *Dugès in Ann. des Sc. nat.* xv. 312 & 335 (1828), pl. 9. f. 8 (the cocoon).
Nephelis vulgaris, *Brightwell in Ann. & Mag. Nat. Hist.* ix. 13. pl. 1. f. 9–14. *Dies. Syst. Helm.* i. 456.
Nephelis octoculata, *Moq.-Tandon, Monogr.* 302. pl. 3, fig. omn. *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 389.
Hirudo octo-oculata seu vulgaris—The eight-eyed Leech, *Dalyell, Pow. Creat.* ii. 14. pl. 2. f. 1–19.

Hab. Stagnant and still-running water.

Obs. From 1 to $1\frac{1}{2}$ inch long, 2 lines broad. The margins are rather sharp and crenulate, and usually yellowish or fawn. The back is variously coloured,—reddish-brown, unicolorous or speckled with yellowish and black dots and lines, or prettily tessellated with

yellowish quadrangular spots arranged in a regular pattern. The ventral surface is olivaceous or reddish-brown, unspotted. At certain seasons there appears, on the anterior third of the body, a broad belt or clitellus, most apparent on the belly; and in the middle of it there is the orifice whence the ova are excluded. The young are greyish, with dusky interranea forming an ill-defined fascia along each side.

Müller and Moquin-Tandon have characterized twelve varieties from the peculiar patterns on which the colours are disposed; and four of these Savigny has described as distinct species. I have found three of them in Coldingham Lough.

(*a*) The Whiteadder, Berwickshire, *Dr. Johnston*.

5. TROCHETA.

Trocheta, *Moq.-Tandon, Monogr.* 308. *Dies. Syst. Helm.* i. 459.
Trochetia, *Lam. An. s. Vert.* v. 291. *Blainville in Dict. des Sc. nat.* xlvii. 244. *Cuv. Règn. Anim.* iii. 215.
Geobdella, *Blainville in lib. cit.* xlvii. 244, & lvii. 559.

Char. Body elongate, flattish, smooth, acephalous, composed of numerous subequal narrow segments separated by a simply impressed line: mouth large, oblique, with the thick prominent obtuse upper lip curling over it: eyes 8, small, the front row lunate, the hinder one transverse: sexual orifices between the 32nd and 33rd, and between the 37th and 38th rings: vent large, semilunate: anal sucker of medium size, attached in the centre, directed ventrally. Ova in coriaceous capsules, free, deposited in moist ground.

1. T. subviridis.

Trochetia subviridis, *Lam. An. s. Vert.* v. 292; 2de édit. v. 523. *J. E. Gray in Ann. & Mag. Nat. Hist.* ser. 2. vii. 429.
Geobdella de Dutrochet, *Blainville in Dict. des Sc. nat.* xlvii. 246, lvii. 559, *Atlas pl. Hirudin.* f. 6. *Egidy, Bluteg.* 109.
Trocheta subviridis, *Moq.-Tandon, Monogr.* 309. pl. 4, fig. omn. *Dies. Syst. Helm.* i. 459.

Hab. Boggy ground, subterranean ditches and runlets. Feeds on the earth-worm.

Obs. The specimen in the Museum was, when alive, more than 7 inches long. It is yet fully 6, and $\frac{1}{2}$ an inch in diameter. The dorsal surface is of a uniform dull greenish-grey colour; the ventral a shade lighter, and more muscular. The rings are narrow, nearly equal, marked by a simply impressed separating line, and not crenulate on the margins. The mouth is large, transverse, subtriangulate, with a thick muscular overlapping upper lip, which is somewhat crisped. There is a blackish fascia across the front above the lip, but I can detect no eyes; and Moquin-Tandon says that they are frequently difficult to be seen, and are sometimes absent. About an

inch and a half behind the mouth the female aperture is very distinct, but the male one is invisible. The vent is very large ; and the sucker is shallow with a thin rim.

(*a*) Regent's Park. Zoological Society.

6. AULOSTOMA.

Aulostoma, *Moq.-Tandon, Monogr.* 312.
Pseudobdella, *Blainville in Dict. des Sc. nat.* xlvii. 246 & lvii. 559.
Aulostomum, *Diesing, Syst. Helm.* i. 461.

Char. Body elongate, narrowed forwards, depressed, soft, acephalous, composed of many equal segments, the sexual orifices between the 24th and 25th, and the 29th and 30th : penis cylindrical : mouth oblique, suctorial, with the upper lip almost lanceolate and protruded in a semi-ellipse ; the gullet with twelve long plaits. Eyes 10, in a curved line : anal sucker rather small, centrally attached with a ventral aspect : vent large and semilunate. Ova in a free fibrous cocoon, multiparous. Lacustrine, often resident on the humid margin. Carnivorous.

1. **A. gulo.**

Hirudo maxime apud nos vulgaris, The Horse-Leech or Blood-Sucker, *Raii Hist. Insect.* 3.
Horsleech, *Mouf. Theat. Insect.* 323, fig.
Hirudines venenatæ, Horse-Leeches, *Sibb. Scot. Illustr.* ii. 3. 34. *Hill, Hist. Anim.* iii. 16. *Quekett in Zoologist*, i. 17 & 88.
Hirudo sanguisuga, *Merret, Pinax*, 207. *Müll. Verm.* i. ii. 38 ; *Zool. Dan. Prod.* 220. *Penn. Brit. Zool.* iv. 70. *Turt. Gmel.* iv. 68 ; *Brit. Faun.* 129. *Stew. Elem.* ii. 356. *Watson, Diss. Inaug. de Hirud.* 13. *Johnson on the Medic. Leech*, 30. *Templeton in Loud. Mag. Nat. Hist.* ix. 235. *Dalyell, Pow. Creat.* ii. 22. pl. 3. f. 1–10.
Hirudo vorax, *Johnson on the Med. Leech*, 62.
Hæmopsis sanguisuga, *Hardy in Tynes. Nat. Club Trans.* i. 96.
Hæmopis nigra, *Savig. Syst. Annel.* 116.
La Sangsue noire, *Blainville in Dict. des Sc. nat.* xlvii. 249.
Pseudobdella nigra, *Blainv. lib. cit.* lvii. 560, *Atlas Hirudin.* f. 1. *Egidy, Bluteg.* 111. f. 66.
Hæmopsis sanguisorba, *Brightwell in Ann. & Mag. Nat. Hist.* ix. 12.
Aulostoma gulo, *Moq.-Tandon, Monogr.* 313. pl. 5. f. 1–6.
Aulostoma nigrescens, *Cuv. Règn. Anim.* iii. 215. *Williams, Rep. Brit. Assoc.* 1851, 238.
Aulostomum gulo, *Dies. Syst. Helm.* i. 461.

β. **nigra**, "Hirudo elongata, per totum corpus nigerrima," *Johnson, Med. Leech*, 32.

Hab. Stagnant waters : common.

Obs. In extension about 4″ in length ; when contracted somewhat granulous. Dorsal surface of a dark olive-green colour or almost black, ventral surface yellowish-green ; but the leech is variable in

depth of colouring, and is either prettily and thickly spotted, or sparingly spotted, or unspotted. Anterior pair of eyes approximate, the posterior widest asunder and apart. In some individuals the ventral surface is scarcely different in colour from the dorsal, and in these a yellow line runs along the edges.

(*a*) Islington, *J. F. Stephens.*
(*b*) Lough in Holy-Island, *Dr. Johnston.*
(*c*) The Whiteadder, Berwickshire, *Dr. Johnston.*

Fam. IV. HIRUDINIDÆ.

Obs. This family is suctorial. Cutting into the skin they suck the blood of vertebrate animals, and only fall away when gorged. The alimentary canal is deeply incised and lobed, with the hinder pair of lobes elongated in an intestinal manner. In these the blood will often remain for days and weeks undigested. They endure long abstinence without any apparent loss of bulk. They are lacustrine, but willingly remain out of the water, where they seem to spend the greater portion of their summer life. They become hidden in winter. The ova are involved in a free sponge-like capsule.

7. HÆMOPSIS.

Hæmopsis, *Savig. Syst. Annelid.* 107 & 115. *Moq.-Tandon, Monogr.* 317. *Diesing, Syst. Helm.* i. 462.
Hippobdella, *Blainville in Dict. des Sc. nat.* xlvii. 251, lvii. 560.

Char. Body elongate, widening backwards, depressed, of numerous distinct segments, with the sexual orifices between the 24th and 25th, and the 29th and 30th: acephalous: mouth large, with the upper lip protruded and almost lanceolate: jaws 3, small, equal, oval, not compressed, with a few blunt denticles: eyes 10, on a curved line, six approximate on the first segment, two on the second, and two on the third: vent small and round: anal sucker large, obliquely terminal. Ova in a spongy cocoon. Lacustrine.

1. **H. sanguisuga**, greenish-black on the dorsal, and a yellowish-green on the ventral surface, marked with irregular spots: eyes indistinct. Length 4″; breadth 5‴.

Hirudo depressa fusca margine laterali flavo, *Linn. Faun. Suec.* 364.
Sanguisuga, *Petiv. Gazoph.* 7. tab. 130. f. 7.
Hirudo sanguisuga, *Linn. Syst.* x. 649, xii. 1079; *Faun. Suec.* 2nd edit. 505.
Hirudo sanguisorba, *Lam. Anim. s. Vert.* v. 291; 2de édit. v. 521. *Payraudeau, Annelid. & Mollusq. de Corse*, 17.
Hæmopis sanguisorba, *Savig. Annel.* 115. *Dies. Syst. Helm.* i. 462.
La Sangsue des chevaux, *Cuv. Règ. Anim. Illust. Annel.* 49.

La Sangsue de cheval, *Blainv. Dict. des Sc. nat.* xlvii. 252. *Milne-Edwards, Elem. Zool.* ii. 227.
Hippobdella sanguisuga, *Blainv. Dict. des Sc. nat.* lvii. 561.
Hippobdella sanguisorba, *Blainv. Dict. Atlas Hirud.* f. 2. *Egidy, Bluteg.* 134. f. 67.
Hæmopis sanguisuga, *Moq.-Tandon, Monogr.* 318.

β. **fusca**, body almost cylindrical, the back of a very deep brown, unbanded; the margins of the same colour.

Hirudo fusca, *Blainv. Dict. des Sc. nat.* xlvii. 273. *Moquin-Tandon, Monogr.* 348.

Hab. Lakes and ponds.

Obs. The variety is a disputable worm. Blainville inquires if it may not be the *Trocheta subviridis*. Derheims says that it is found in the north of Scotland, and is rather terrestrial than aquatic in its habits.

8. HIRUDO.

Hirudo, *Linn. Syst.* x. 649. *Moquin-Tandon, Monogr.* 326. *Dies. Syst. Helm.* i. 465.
Sanguisuga, *Savig. Syst. Annel.* 113. *Lam. Anim. s. Vert.* 2de édit. v. 520; *Encyclop. Brit.* xi. 225.
Iatrobdella, *Blainville in Dict. des Sc. nat.* xlvii. 253 & lvii. 561.

Char. Body elongate, insensibly widening backwards, plano-convex, composed of numerous narrow equal very distinct segments, margined: acephalous; the oral sucker with an entire thick plaited rim, the upper lip prominent, obtusely lanceolate: mouth large, with three equal compressed jaws, multidenticulate on the cutting edge: eyes 10, on a curved line; six on the first segment, two on the third, and two on the sixth, remote from the others: anal sucker rather small, with a ventral aspect, radiatingly plaited: vent minute, round. Encloses the ova in a free spongy cocoon.

1. **H. medicinalis**, greenish-olive or very dark green or brown, with six interrupted yellowish fasciæ along the back, sometimes obsolete; the marginal band straight. Length 4–7″; breadth 6‴.

Hirudo major, *Gesner, Hist. Pisc. & Aquatil.* 503, cum fig.
Hirudo, *Aldrov. de Insect.* lib. 7. 722, *and the* fig. p. 765. *Willis in Act. Hafn.* iii. 120, cum fig. rud.
La Sangsue, *Rondel. Poiss.* ii. 169.
Hirudo alia parvis tuberculis nonnihil aspera medicinalis, *Raii Hist. Insect.* 3.
Hirudines innoxiæ vulgares, *Sib. Scot. Illustr.* ii. 3. 34.
Hirudo depressa nigra abdomine subcinereo, *Linn. Faun. Suec.* 365.
The Common Leech, *Hill, Hist. Anim.* iii. 16. pl. 2.
The Leech, *Swammerd. Bib. Nat.* i. 28. *Rep. Ray Soc. Zool.* 1847, 511.

Hirudo medicinalis, *Linn. Syst.* x. 649, xii. 1079; *Faun. Suec.* 2nd edit. 505. *Weser in Amœn. Acad.* vii. 45. *Müll. Verm.* i. ii. 37; *Zool. Dan. Prod.* 219. *Penn. Brit. Zool.* iv. 36. *Turt. Gmel.* iv. 68. *Turt. Brit. Faun.* 129. *Stew. Elem.* ii. 356. *Penn. Brit. Zool.* iv. 69 (1812). *Watson, Disp. inaug. de Hirudine*, 12. *Blumenb. Man.* 244. *Johnson on the Med. Leech*, 29. *Bojanus in Journ. de Physique*, lxxxviii. 468 (1819), pl. f. 1–5. *Lam. An. s. Vert.* v. 291; 2de édit. v. 520. *Stark, Elem.* ii. 143. *Leach in Supp. Encyclop. Brit.* i. 451. pl. 26. *Home, Comp. Anat.* iv. pl. 39. f. 3; *ibid.* ii. 70. *Ephem. Acad. Leop.* cent. viii. 338. tab. 5. f. 1–3. *D. Chiaje, An. s. Vert. Nap.* i. 47. *Moq.-Tandon, Monogr.* 327. pl. 7–11. f. 1–18. *Payraud. Annel. et Mollusq. de Corse*, 17. *Jones, An. Kingd.* 191. *Christison, Edin. Disp.* 488. *Dies. Syst. Helm.* i. 465. *Dalyell, Pow. Creat.* ii. 26. pl. 3. f. 11.

Sanguisuga medicinalis, *Savig. Annel.* 114. *Encyclop. Brit.* xi. 225. pl. 176. f. 14. *Risso, l'Europ. Mérid.* iv. 428. *Brightwell in Ann. & Mag. Nat. Hist.* ix. 13.

La Sangsue, *Lesser, Insect. Theol.* ii. 181. *Milne-Edwards, Elem. Zool.* ii. 226.

La Sangsue médicinale, *Blainv. Dict. des Sc. nat.* xlvii. 254. *Cuv. Règ. Anim. illustr. Annel.* 49.

Iatrobdella medicinalis, *Blainville in Dict. des Sc. nat.* lvii. 561, *Atlas Hirudin.* f. 4, et tab. sec. f. 1. *Egidy, Bluteg.* 113. f. 62, 63.

Medicinal Leech, *Kurzmann in Lond. Med. & Physic. Journ.* xli. 312 (1819). *Fremond in Ann. & Mag. Nat. Hist.* ser. 2. viii. 431.

Hab. Lakes and ponds.

Obs. There is a series of granules, on a raised line, across the middle of every segment. Mr. Bowerbank has given an elaborate description of the cocoon in Ann. & Mag. N. H. xv. 301. pl. 18, fig. omn. The only British specimens I have seen are those in the Museum Collection; and they may be referred to the variety **chlorogastra** of Moquin-Tandon. The specimen (*b*) from Weymouth is manufactured I know not how. It has the shape of a Glossiphonia. When let fall in a plate the sound made is like that which a stone of the same size would produce, and suggests a passing suspicion that the body may be fossil. Its real character is disclosed by an examination of the eyes more especially.

(*a*) Christchurch, Hants, *J. C. Dale.*

(*b*) Weymouth, *W. Thompson.*

Tribe II. CLEPSINEA, *Grube.*

Fam. V. GLOSSOPORIDÆ.

Obs. These are small and neat leeches, usually so transparent as to permit the disposition of the viscera to be seen without any dissection. They are further distinguished, 1st, by having a cylindrical proboscis capable of being extruded at will from the oral aperture; 2nd, by being more strictly geometric in their mode of progression than other leeches, and capable of contracting the body into a ball

when alarmed almost as completely as the wood-louse; and 3rd, by carrying the young attached to the belly for a considerable time after their birth. The ova are not enclosed in a capsule.

9. GLOSSIPHONIA.

Glossiphonia, *Johnson on the Med. Leech*, 25 (1816). *Moq.-Tandon, Monogr.* 352.
Glossopora, *Johnson's Furth. Observ.* 48.
Clepsine, *Savig. Syst. Annel.* 118. *Cuv. Règ. An.* iii. 216. *Mueller de Hirud. Berol.* 13. 17. *De Filippi in Ray Soc. Rep.* 1845, 286. *Diesing, Syst. Helm.* i. 446.
Glossobdella, *Blainville in Dict. des Sc. nat.* xlvii. 262, lvii. 564.

Char. Body oval or pear-shaped, extensile, convex dorsally, flat on the ventral surface, crisp and firm or gelatinous, of many equal narrow rings, the sexual pores between the 20th and 21st, and between the 24th and 25th: oral sucker small, with a semi-elliptical protruded lip formed of three segments, the front segment obtuse: mouth circular, furnished with a cylindrical proboscis: eyes distinct, variable in number, in pairs on each side of the mesial line: segments ternate: anal sucker attached in the middle, proportionably small, inferior: vent round. Tenants of pure fresh waters. Incapable of swimming. Do not voluntarily leave the water. Oviparous, depositing the ova on the concave belly, or on subaquatic bodies. For an account of their development see Grube's "Untersuchungen über die Entwicklung der Anneliden." Königsberg, 1844.

1. **G. tessellata**, soft and gelatinous, widening posteriorly, greyish-green, with from two to six series of yellowish dots along the back; head indistinctly defined; eyes 8, in two series converging forwards. Length 18‴; breadth 5‴.

Hirudo tessulata, *Müll. Verm.* i. ii. 45; *Zool. Dan. Prod.* 220. *Johnson, Med. Leech*, 33. *Fleming in Wern. Mem.* iii. 400.
Erpobdella tessulata, *Flem. Phil. Zool.* ii. 604. *W. Thompson in Ann. Nat. Hist.* xiii. 437.
La Sangsue marquetée, *Blainv. Dict. des Sc. nat.* xlvii. 261.
Ichthyobdella tessellata, *Blainv. lib. cit.* lvii. 558.
Erpobdella vulgaris, var. tessellata, *Blainv. lib. cit.* lvii. 564.
Clepsine tessulata, *Mueller, Hirud. Berol.* 21. *Diesing, Syst. Helm.* i. 447.
Glossiphonia tessellata, *Moq.-Tandon, Monogr.* 379.
Hirudo tessellata—the chequered Leech, *Dalyell, Pow. Creat.* ii. 38. pl. 4. f. 24–30.

Hab. Weedy ponds.

Obs. A fine species remarkable for its gelatinous consistency. The dorsal surface is roughish, with minute sharp granules. The

margins are crenulate. When contracted the body is almost round, the head forming a short apiculus. Gregarious.

(*a*) Holy-Island Lough, *Dr. Johnston*.

2. **G. verrucata**, subcartilaginous, ovato-elliptical, scarcely narrowed in front, the back with six rows of prominent granules; acephalous; eyes 6, in three parallel pairs; ventricular appendages seven pairs, the posterior terminating between the first and second pairs. Length 14‴.

Clepsine verrucata, *Mueller, Hirud. Berol.* 23.

Hab. Ponds.

Obs. The original colour of the specimens is discharged by the spirits, and they have become ochre-yellow with pale brown lines, on which the whitish tubercles are placed. These are in six nearly equidistant rows, the granules of the middle rows being rather less than those of the dorsal and marginal. The eyes I cannot distinguish: they have sunk from the contraction of the rings produced by the spirits in which they have been killed.

(*a*) Cobham, Surrey, *Mus. Leach.*

3. **G. granifera**, subcartilaginous, dilated posteriorly, granulous on both surfaces, the sides thickened and marginate on the ventral aspect; eyes 6, the anterior pair approximate. Length 10‴.

Hab. Ponds.

Obs. Differs from every described species in having a thickened raised margin on each side which extends along about two-thirds of the body. The granules also are not disposed in longitudinal series, but cover the entire body, there being a series across each segment. The granules are rather less than those of *G. verrucata*. The eyes are distinct.

(*a*) —— ? *Mr. Joshua Alder*, who does not recollect from what locality the specimen was procured. It is probably a native of the Northumberland lakes.

4. **G. sexoculata**, crisp and subcartilaginous, pear-shaped, greyish-green, lineated, and marked on each side of the mesial line with a dark fascia studded with equidistant whitish granules; acephalous; eyes 6, in two subparallel rows; six pairs of ventricular appendages, the posterior pair terminating between the second and third pairs. Length 8‴; breadth 2–3‴.

A small sort of Leech, *Baker, Employm. Micros.* 415.

Hirudo complanata, *Linn. Syst.* x. 650, xii. 1079; *Faun. Suec.* 2nd edit. 506. *Müll. Verm.* i. ii. 47; *Zool. Dan. Prod.* 220. *Turt. Gmel.* iv. 69. *Turt. Brit. Faun.* 129. *Ure's Rutherglen*, 233. *Stew. Elem.* ii. 357. *Penn. Brit. Zool.* iv. 72 (1812). *Dalyell, Pow. Creat.* ii. 30. pl. 4. f. 1–16.

Hirudo crenata, *Shaw in Linn. Trans.* ii. 320. pl. 29*. *Turt. Gmel.* iv. 71. *Turt. Brit. Faun.* 129. *Penn. Brit. Zool.* iv. 71 (1812).
Glossiphonia tuberculata, *Johnson on Med. Leech*, 25.
Glossopora tuberculata, *Johnson*, *Furth. Obs.* 49. pl. 17. f. 1–10. *Stark*, *Elem.* ii. 142. *W. Thompson in Ann. & Mag. Nat. Hist.* vii. 482.
Erpobdella complanata, *Lam. An. s. Vert.* v. 296; 2de édit. v. 528. *Templeton in Loud. Mag. Nat. Hist.* ix. 235.
Clepsine complanata, *Savig. Annel.* 120. *Risso, l'Europ. Mérid.* iv. 431. *Muell. Hirud. Berol.* 25. *E. Blanchard in Ann. des Sc. nat.* iv. 377 (1845), pl. 18. f. 9. *Dies. Syst. Helm.* i. 452.
Glossobdella complanata, *Blainv. Dict. des Sc. nat.* xlvii. 263, lvii. 565, *Atlas Hirud.* f. 1.
Glossopora complanata, *Flem. Phil. Zool.* ii. 604.
Erpobdella crenata, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.
Clepsina complanata, *Brightwell in Ann. & Mag. Nat. Hist.* ix. 14. pl. 1. f. 18, 19.
Glossiphonia sexoculata, *Moq.-Tandon*, *Monogr.* 354. pl. 12, fig. omn.

Hab. Lakes, ponds, and rivulets: common.
(*a*) The Whiteadder, Berwickshire, *Dr. Johnston*.

5. **G. heteroclita**, subcartilaginous, flattened, diaphanous, pear-shaped, acephalous, yellowish, the margins scarcely crenate; eyes 6, the first pair approximate. Length 5‴.

Un Ver plat et blanc, *Trembley, Polyp.* 147. pl. 7. f. 7.
Hirudo heteroclita, *Linn. Syst.* xii. 1080; *Faun. Suec.* 2nd edit. 506. *Johnson on the Med. Leech*, 34.
Hirudo hyalina, *Müll. Verm.* i. ii. 49; *Zool. Dan. Prod.* 220. *Stew. Elem.* ii. 357. *Baer in Nov. Act. Curios.* xiii. 728. tab. 32. f. 11.
La Sangsue hyaline, *Blainv. Dict. des Sc. nat.* xlvii. 263.
Glossobdella hyalina, *Blainv. lib. cit.* lvii. 565.
Clepsina hyalina, *W. Thompson in Ann. & Mag. Nat. Hist.* xiii. 437. *Brightwell in ibid.* ix. 15. pl. 1. f. 20.
Clepsine hyalina, *Mueller, Hirud. Berol.* 27. *Diesing, Syst. Helm.* i. 453.
Glossiphonia heteroclita, *Moq.-Tandon, Monogr.* 358. pl. 13. f. 1–6.

Hab. In lakes, hiding in the leaves of aquatic plants.

Obs. The back is sometimes speckled with blackish dots. Very sluggish. Attaches the ova to its own abdomen. Not the young of the preceding.

6. **G. bioculata**, subcartilaginous, oblong, narrower in front, acephalous, greyish-white with black specks; eyes 2. Length 8‴; breadth 2‴.

Hirudo stagnalis, *Linn. Faun. Suec.* 2nd edit. 506; *Syst.* xii. 1079. *Turt. Gmel.* iv. 69. *Turt. Brit. Faun.* 129. *Penn. Brit. Zool.* iv. 71 (1812). *Dalyell, Pow. Creat.* ii. 36. pl. 4. f. 17–23.

* Kirby had *G. bioculata* in view in his description, which Shaw illustrated with a good figure of *G. sexoculata*.

Hirudo bioculata, *Müll. Verm.* i. ii. 41; *Zool. Dan. Prod.* 220. *Stew. Elem.* ii. 357. *Ure's Rutherglen*, 234.
Hirudo crenata, *Kirby in Linn. Trans.* ii. 318.
Glossiphonia perata, *Johnson on Med. Leech*, 26.
Glossopora punctata, *Johnson, Furth. Obs.* 50. pl. 17. f. 11–13.
Erpobdella bioculata, *Lam. An. s. Vert.* v. 296; 2nd edit. v. 528.
Clepsine bioculata, *Savig. Annel.* 119. *Muell. Hirud. Berol.* 31. *Dies. Syst. Helm.* i. 448.
La Sangsue bioculée, *Blainv. Dict. des Sc. nat.* xlvii. 265.
La Sangsue pulligère, *Blainv. lib. cit.* 266.
Glossobdella bioculata, *Blainv. lib. cit.* lvii. 565.
Glossopora bioculata, *Flem. Phil. Zool.* ii. 604.
Erpobdella stagnalis, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.
Clepsina stagnalis, *Brightwell in Ann. & Mag. Nat. Hist.* ix. 14.
Glossiphonia bioculata, *Moq.-Tandon, Monogr.* 366. pl. 13. f. 16–26.

Hab. Lakes, ponds, and ditches: common.
(*a*) Holy-Island Lough, *Dr. Johnston.*

Of the following species I have seen no specimens:—

7. **G. flava**, flattish, dilated backwards, yellow; the head lanceolate or "trout-shaped;" eyes 2, black. Length 14‴.

Hirudo flava—the Yellow Leech, *Dalyell, Pow. Creat.* ii. 45. pl. 5. f. 1–19.

Hab. Ponds: rare.

Obs. "This is one of the few Leeches which we are enabled to distinguish by the form of the head." Margins slightly crenated. The colour is either very vivid yellow or dusky, and there are sometimes four rows of yellow spots down the back.—*Dalyell.*

8. **G. circulans**, oblong, narrowed forwards, the dorsal surface reddish, flat and pale underneath; eyes 2. Length 1″.

Hirudo circulans, *Johnson on the Med. Leech*, 27. *Turt. Brit. Faun.* 129. *Penn. Brit. Zool.* iv. 72 (1812).
Glossiphonia circulans, *Moq.-Tandon, Monogr.* 384.
Clepsine Sowerbyi, *Dies. Syst. Helm.* i. 451.

Hab. Ponds.

9. **G. vitrina**, nearly cylindrical, dark green, with two indistinct whitish longitudinal series of spots on the dorsum; eyes 8, in two parallel series. Length 1″.

Nephelis tesselata?, *Brightwell in Ann. & Mag. Nat. Hist.* xiii. pl. 1. f. 15–17.
Hirudo vitrina, *Dalyell, Pow. Creat.* ii. 42. pl. 5. f. 20–23.

Hab. Rare. In rivers and pools.

Obs. "Like the *tessulata*, the substance is tremulous, though to a slighter degree than in that animal."—*Dalyell.*

10. **G. eachana**, body oval; anterior portion not dilated into a distinctly-formed head; back smooth; margin slightly crenulate; eyes 8; stomachal lobes 8, subpinnate; prevailing hue hyaline. Length 9‴; breadth 2‴.

Glossiphonia eachana, *W. Thompson in Ann. & Mag. Nat. Hist.* xviii. 390, fig.

Hab. Lough Neagh, *W. Thompson.*

11. **G.? lineata**, elongate, greyish, the back marked in a longitudinal direction with four dark lines; eyes 6, in two transverse series, the front larger than the hinder ones. Length 16‴; breadth 2‴.

Hirudo lineata, *Müll. Verm.* i. ii. 39; *Zool. Dan. Prod.* 220. *Johnson on Med. Leech*, 34. *Fleming in Wern. Mem.* iii. 400. *Blainv. Dict. des Sc. nat.* xlvii. 264.
Erpobdella lineata, *Flem. Phil. Zool.* ii. 604.
Glossobdella lineata, *Blainv. Dict.* lvii. 565.
Glossiphonia? lineata, *Moq.-Tandon, Monogr.* 381.
Clepsine lineata, *Dies. Syst. Helm.* i. 455.

Hab. Marshes: rare.

Obs. This is placed by Diesing among the "species inquirendæ," and is of uncertain genus.

Order IV. SCOLOCES.

Annelides abranches setigères, *Cuv. Règ. Anim.* iii. 209.
Annelides lumbricinæ, *Savig. Syst. Annel.* 99.
Lombricinés, *Blainv. Princip. d'Anat. Comp.* i. tab. 7 (1822).
Lombricini, *Latr. Fam. Nat.* 246.
Lumbricina, *Macleay in Murchison's Silurian System*, ii. 699 (1839); *and in Ann. Nat. Hist.* iv. 385.
Annelides terricoles, *Audouin & Milne-Edwards, Litt. de la France*, ii. 50; *and in Lam. An. s. Vert.* 2de édit. v. 513.
Abranchia setigera, *Fleming in Encyclop. Brit.* 7th edit. xi. 222.
Annelida terricola, *Jones, Anim. Kingd.* 189. 201.
Annélides terricoles ou Abranches setigères, *Milne-Edwards, Elem. Zool.* 2de édit. ii. 225.
Scoleides, *M.-Edwards sec. E. Blanchard in Ann. des Sc. nat.* viii. 134 (1847).
Oligochaeta, *Grube, Fam. Annelid.* 27.

Char. Body vermiform, distinctly segmented, the segments without any soft appendage, but furnished with spines or spinets or setaceous bristles partially retractile: head either undefined or marked by its form, without any appendages: mouth inferior, emaxillary: no external organs of respiration: blood red, yellow, or rarely colourless: anus terminal: sexual pores in pairs, placed forwards on the venter on each side of the mesial line. Terricolous, dwelling in moist earth or in mud saturated with water, which they swallow and from which they extract their food. Hermaphroditical. Oviparous or multiplying by spontaneous division. Capable of reproducing amputated portions. No metamorphosis. A few excrete a phosphorescent fluid; and the skin of a few is iridescent. The bristles are always simple, and solitary or fasciculate.

The following is a synopsis of the British genera:—

Tribe I. Lumbricina.

Head indistinct: all the segments, excepting the first, armed with setæ.

Family I. **LUMBRICIDÆ.** Terrestrial or burrowing in the mud covered with fresh water.

1. **Lumbricus.** Setæ single, 8 to each segment, quadriserial.

2. **Enchytræus.** Setæ quadriserial, 3–4 in a fascicle: blood colourless.
3. **Sænuris.** Setæ quadriserial, 3–9 in a fascicle: blood red.

Family II. **LITTORELES.** Littoreal, burrowing in wet mud mixed with sand.

4. **Clitellio.** Setæ quadriserial, fasciculate: the body with a white clitellus.
5. **Valla.** Segments armed with setaceous bristles in four fasciculate series; the 10th segment with strong spines.

Tribe II. Naidina.

Head distinct from the body, the first three or four segments without bristles.

Family III. **NAIDES.** The only family.

* *The four front segments without superior setæ.*

6. **Proto.** Anal extremity with digitiform (branchial?) appendages.
7. **Stylaria.** Oral extremity produced into a style.
8. **Serpentina.** Ophiocephalous: anal extremity naked.
9. **Nais.** Head continuous with the body: oral extremity truncate, the anal rounded, obtuse.

** *All the segments without superior setæ.*

10. **Chætogaster.**

IV. SCOLOCES.

I. LUMBRICINA.

Fam. I. LUMBRICIDÆ.

Lumbricus, *Linn. Syst.* 1076. *Müll. Verm.* i. ii. 24.
Les Lombrics, *Cuv. Règn. Anim.* iii. 269.
Les Echiurées, *Lam. An. s. Vert.* v. 297.
Lumbrici, *Savig. Syst. Annel.* 100 & 103.
Lumbricina, *Blainville in Dict. des Sc. nat.* lvii. 493.
Earth-Worms, *Derham, Phys. Theol.* 223 & 393.

Obs. Oersted has separated the Lumbricidæ into two families,—the Terricolæ and the Lumbricillæ. The Terricolæ embrace the larger and fleshier, and hence the comparatively opake, species, which are further distinguished by the spines being solitary in their insertion, short, straight, subulate, and only a little protruded. The Lumbricillæ are subpellucid, living in the wet mud of rivulets or on the sea-shore. The bristles are two or more in a common insertion, hooked or subulate, and protruded to a greater length. The Terricolæ burrow in the earth and trail with difficulty along the surface; but the more vivacious Lumbricillæ partly creep and partly swim. On a first glance these characters seem distinctive enough; but, I believe, it will be found impossible to sustain the separation of the families in practice.

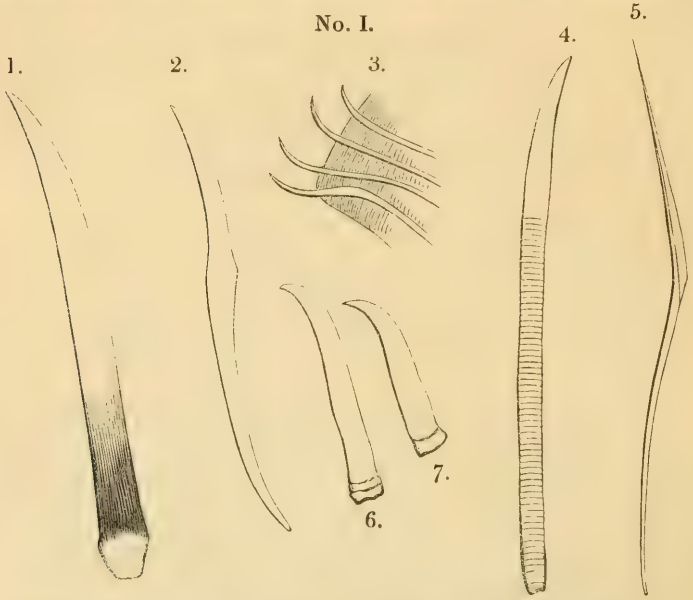
In this tribe it seems necessary to distinguish three sorts of Bristles:—(1) the Spine distinguished by being tapered from an obtuse base to a point slightly bent (Woodcut No. I. fig. 1); (2) the Spinet by being slightly bent and pointed at both ends (fig. 2); and the Bristle proper (fig. 5) which is slender and setaceous like a hair. The latter are always fasciculate.

1. LUMBRICUS.

Lumbricus, *Linn. Syst.* x. 647. *Cuv. Règ. Anim.* iii. 209. *Lam. An. s. Vert.* v. 298. *Schweig. Handb.* 590. *Blainville in Dict. des Sc. nat.* lvii. 494. *Leach in Supp. Encyclop. Brit.* i. 451. *Duyès in Ann. des Sc. nat.* xv. 289. *Hoffmeister, Regenw.* 4. *Williams in Rep. Brit. Assoc.* 1851, 218.
Enterion, *Savig. Syst. Annel.* 103.

Char. Body vermiform, distinctly annulated, with narrow nearly equal segments, the first (head) small, lobe-like, retractile within the

second, and overlooking the wide circular mouth, which is furnished with a very short proboscis: segments furnished with eight spines and spinets in four pairs, two on each side and two on the venter:



sexual orifices opening on the ventral surface of segments anterior to the clitellus: clitellus distinct, formed by the thickening and coalescence of several segments: anus a longitudinal cleft in the small terminal segment. Blood-red: stomach muscular: oviparous, the eggs capsulated: terrestrial.

1. **L. terrestris**, clitellus of six segments; vulvæ on the 16th; upper lip mammillate; second or buccal segment with two impressed furrows behind the snout extended from margin to margin; tail flattened, spathulate. Length 8–10″.

β. The furrows on the second segment connected by a line thus |—|.

Lumbricus major, *Mouf. Theat. Insect.* 178. *Raii Hist. Insect.* i.
Vermes terrestres majores, *Merr. Pin.* 206.
Earth-worm, *Sibb. Scot. Illust.* ii. 3. 33.
Lumbrici terrestres vulgares, qui matutino tempore bini conjuncti passim observantur, Dew-Worms Anglice dicti, *Raii Hist. Insect.* iii.
Lumbricus terrestris, *Willis, Oper. Omn.* ii. 18. tab. 4. *Linn. Syst.* var. β. 1076; *Faun. Suec.* 2nd edit. 504. *Müll. Zool. Dan. Prod.* no. 2602; *Verm.* i. ii. 24. *Penn. Brit. Zool.* iv. 33. tab. 19. f. 6, & edit. 1812, iv. 63. pl. 20. f. 1. *Turt. Gmel.* iv. 58. *Turt. Brit. Faun.* 128. *Home, Comp. Anat.* iv. pl. 40. f. 4, & pl. 145, 146, 147.

148 & 149. *Stew. Elem.* ii. 354. *Stark, Elem.* ii. 141. *Leach in Supp. Encyclop. Brit.* i. 451. pl. 26. *Blainville in Dict. des Sc. nat. Atlas*, pl. fig. omn. *Blumenbach, Nat. Hist. Transl.* 241. *Templeton in Loud. Mag. Nat. Hist.* ix. 234. *Garner's Staffordsh.* 331.

Ver de terre, *Bonnet, Insect.* ii. 212. pl. 3. *Lyonnet in Lesser's Insect. Theol.* i. 156. pl. 2. f. 3.

The Lumbricus or Earth-worm, *Smellie, Phil. Nat. Hist.* i. 99 & ii. 123.

Common Earth-worm, *White's Selborne*, ii. 14 & 279; *Edin. Phil. Journ.* iii. 412 & ix. 409. *Loudon's Suburb. Horticult.* 94. *J. E. Gray in Ann. Nat. Hist.* ix. 234. *Loudon's Garden. Mag.* xvii. 212 (1841).

Lumbricus terrester, *Blumenb. Man.* 241. pl. fig. 7. *Grube, Ann.* 99.

Lumbricus terrestris norvegicus, *Fabric. Faun. Grœnl.* 277.

Lumbricus maximus, *Mus. Leach.*

Lumbricus trapezoides, *Dugès in Ann. des Sc. nat.* xv. 289 & 291. pl. 9. f. 13, 14 & 21.

Lumbricus herculeus, *Dugès in Ann. des Sc. Nat.* ser. 2. viii. 21.

Lumbricus agricola, *Hoffmeister, Art. der Regenw.* 5. pl. f. 1. opt.

The Lob-worm or Dew-worm, *Hofland's Angler's Man.* 9.

The Earth-, Lob-, or Dew-worm, *Stoddart's Ang. Compan.* 110. *Younger on River Angling*, 76.

β. Lumbricus festivus, *Dugès in Ann. des Sc. nat.* ser. 2. viii. 21. pl. 1. f. 6.

Hab. A loose rich soil, more especially a recent vegetable mould. Common everywhere.

Obs. The skin reflects a beautiful blue iridescence, more especially from the dorsal margins of the segments. The basis of the spines (as in most of our species) is of a clear brown (fig. 1); the spinets are colourless (fig. 2).

(*a*) Spring Grove, *Mus. Leach.*

(*b*) Hammersmith, *Dr. J. E. Gray.*

(*c*) Berwick, *Dr. Johnston.*

β. (*a*) Berwick, *Dr. Johnston.*

2. **L. minor**, clitellus of seven or eight segments, on the anterior third of the body; vulvæ on the 16th segment; post-occipital segment unmarked with furrows; anal extremity roundish, not spathulate. Length 2–3″.

Lumbrici minores, rubicundi, majoribus concolores, *Raii Hist. Insect.* iii.

Lumbricus terrestris, *Linn. Faun. Suec.* 2nd edit. 504. *Fabric. Faun. Grœnl.* 276?

Lumbricus terrestris minor, *Penn. Brit. Zool.* iv. 33. pl. 19. f. 6 A.

Lumbricus pulchellus, *Mus. Leach.*

Lumbricus amphisbæna?, *Dugès in Ann. des Sc. nat.* xv. 293.

Lumbricus pygmæus?, *Grube, Fam. Annel.* 100.

The Marsh-worm, *Stoddart, Angl. Comp.* 112. *Hofland, Angl. Man.* 10.

The Red-Head, *Stoddart, Angl. Comp.* 113.

The Red Worm, *Hofland, Angl. Man.* 10.

The Segg-worm, *Hofland, Angl. Man.* 11.
The Peacock-red, or black-headed Red-worm, *Hofland, Angl. Man.* 11.
The Trout-worm, *Prov.*

Hab. Wet gravelly ground on the sides of rivers and burns; under the masses of confervæ, &c. on the front of rocks over which water trickles; &c. Very common.

Obs. The skin is not iridescent, or only so in a slight degree. The segments of the clitellus are commonly so fused together that their number becomes conjectural. A favourite bait for the river trout.

(*a*) Devon, *Mus. Leach.*
(*b*) Hammersmith, *Dr. J. E. Gray.*
(*c*) Berwick, *Dr. Johnston.*

3. **L. viridis**, body greenish, cylindrical, slightly tapered to the tail, with the clitellus near the centre; segments undivided by a line; vulvæ on the 16th. Length 2″.

Lumbrici minores virides, *Raii Insect. Hist.* iii.
Lumbricus riparius, *Hoffmeister, Art. der Regenw.* 30. pl. fig. 4. opt.
Lumbricus chloroticus, *Grube, Fam. Annel.* 99.

Hab. Under stones in pasture fields and at burn-sides: often under the dried droppings of cattle. Common.

Obs. The body is more or less stained of a dirty green or mountain-green colour. The portion posterior to the clitellus is almost cylindrical even to the end, where it rather tapers than dilates; and it appears to be not longer, and sometimes even shorter, than the anterior portion. It is a dull and inactive species, throwing itself into an imperfect coil when disturbed. The spinets seem to be proportionably less than in *L. minor*. It is rejected by the angler.

(*a*) Rhodam, Northumberland, *Dr. Johnston.*

4. **L. anatomicus**, clitellus of seven segments; vulvæ on the 16th; second segment with abbreviate furrows confluent behind so as to define a semioval or quadrangular space behind the head; segments dimidiate. Length 7″.

Lumbricus anatomicus, *Dugès in Ann. des Sc. nat.* xv. 289 (1828), pl. 9. f. 17, 18, 23. *Grube, Fam. Annel.* 99.
L. caliginosus?, *Dugès in Ann. des Sc. nat.* ser. 2. viii. 19.
L. lividus?, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.
Lumbricus communis, *Hoffmeister, Art. der Regenw.* 23. pl. fig. 3.
Black-head or Button-Worm, *Stoddart's Angl. Comp.* 111.
The black-headed small tailed Worm, *Younger on River Angling*, 82.

Hab. In meadows and in gardens. Common.

Obs. The portion of the body anterior to the clitellus is of a uniform dull umber-brown colour, and the posterior portion is a pale orange-brown dusked with the contents of the intestine. There is very often no clitellus, nor is it ever so distinctly marked as in

L. terrestris. There are 7 or 8 segments in it, and 30 or 31 between it and the head. The anterior segments are nearly as long as their diameter, dimidiate; the posterior are numerous, short, with a single ring, and the anal is not more highly coloured than the others. They are all striolate. Much used for bait.

(*a*) Hammersmith, *Dr. J. E. Gray.*

(*b*) Kelso, Roxburghshire, *Dr. G. Douglas.*

5. **L. fœtidus,** body banded with alternate brown and yellow segments. Length 2–3″.

Duggs, *Mouf. Theat. Insect.* 278.
Lumbricus fœtidus, *Dugès in Ann. des Sc. nat.* ser. 2. viii. 21. pl. 1. f. 4. *Grube, Fam. Annel.* 99.
Lumbricus annularis, *Templeton in Loud. Mag. Nat. Hist.* ix. 234.
Lumbricus olidus, *Hoffmeister, Art. der Regenw.* 32. pl. fig. 5. opt.
The Brandling, *Hofland, Angl. Man.* 10. *Stoddart, Angl. Comp.* 113.
Brandling or Bramble-worm, *Younger, Riv. Angling,* 86.

Hab. Very old dung-heaps.

Obs. There are two abbreviate impressed lines on the second segment behind the head. The clitellus is composed of six segments, and there are 26 between it and the head. The bands are most conspicuous on the posterior portion, which has about 64 segments, and is flattened. Exhales a disagreeable odour, of which it is difficult to rid oneself. Much esteemed by the angler.

(*a*) Hammersmith, *Dr. J. E. Gray.*

(*b*) Berwick, *Dr. Johnston.*

(*c*) Kelso, Roxburghshire, *Dr. G. Douglas.*

6. **L. tetraëdrus,** body quadrangular behind; vulvæ below the 15th segment; clitellus with 4–6 segments. Length 3″.

Lumbricus tetraëdrus, *Dugès in Ann. des Sc. nat.* ser. 2. viii. 17 & 23. *Grube, Fam. Annel.* 99.

Hab. Banks of ditches.

Obs. There is a single specimen in the Museum Collection, and it has no clitellus. The species is said to be of a dull brown colour, but the specimen in spirits is bluish-grey. It is of the usual form, but the part posterior to the clitellus is tetragonal, the dorsum as usual a little convex, the venter narrowed and flattened. Most of the segments are dimidiate. The first ten are narrow and nearly equal in diameter, when they are succeeded by four or five twice as broad forming a pseudo-clitellus, otherwise indistinctly defined. The segments posterior to this are narrow, equal, and about 100 in number; the anal semiovate. Head obtuse, with a broad sinus on the second segment occupying about one-half of its length. Bristles geminate, on the angles. Vulvæ on the 14th or 15th segment.

(*a*) Devon, *Mus. Leach.*

7. **L. putor**, body cylindrical, slightly attenuated at either end: clitellus smooth, slightly projecting, reaching from the 25th to the 31st segment, seldom from the 26th or 27th to the 32nd, with longitudinal folds beneath, in which a pair of disks are often visible: vulva mostly inconspicuous, close to the suture between the 15th and 16th segments: lip small, transparent, truncate before, with a broad projection behind bisecting three-fourths of the first segment: no longitudinal fissures beneath. Number of segments 80–96.

Lumbricus putor, *Hoffmeister, Ueber Regenw.* 33. f. 6. *Grube, Fam. Annel.* 99.

Hab. Under the bark of moist decayed trees, and in the sheaths of the leaves of decayed marsh plants.

Obs. I believe this to be a common species, passed over as *L. minor*. My attention was not called to it until I saw Hoffmeister's essay, of which, from my ignorance of German, I have not been able fully to avail myself. I have as yet seen only one specimen. The spines (fig. 6, 7) are readily seen, in pairs. Our specific character is a translation of Hoffmeister's.

Of the following I have seen no specimens :—

8. **L. phosphoreus**, spinets mostly single throughout, tetrastichous; vulvæ on the 15th segment; clitellus with four segments commencing with the 13th; body somewhat flattened behind. Length 15‴.

Lumbricus phosphoreus, *Dugès in Ann. des Sc. nat.* ser. 2. viii. 17 & 24. *Grube.*

Hab. Boggy ground.

Obs. The information on which this species is introduced is unsatisfactory. At the Meeting of the British Association at Cork in 1843, Dr. Allman exhibited "specimens of an annelid which he discovered some years ago in the bogs of the south of Ireland, and which was the cause of a luminous appearance. It was closely allied to the earthworm: when irritated, it gave out a phosphorescent light, which was also much increased when the animal was exposed to the vapour of alcohol. The light was of the peculiar green colour so usual in the phosphorescence of living animals. The Rev. F. B. Clarke had also found these annelids in the bogs of Connaught" (*Trans. Brit. Assoc.* 1843, p. 76). At a meeting of the Lit. and Phil. Society of Liverpool, Nov. 14, 1853, Mr. Henry Cox exhibited an earthworm which was phosphorescent (*Proceedings*, no. viii. p. 57).

9. **L. xanthurus**, "of a bright red, the apical rings yellow."

Yellow-tailes, *Mouf. Theatr. Insect.* 278.
The Gilt-tail, *Raii Hist. Insect.* iii. *Stoddart, Angl. Comp.* 114.

Lumbricus xanthurus, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.
The Gilt-tail or Tag-worm, *Hofland, Angl. Man.* 10.

Hab. "Found among rotten oak-bark, in old hot-beds and melon frames," *Templeton.*

Obs. Apparently some slight variety of *L. fœtidus.*

10. **L. gordianus,** "of a pale rosy red."

Lumbricus gordianus, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.

Hab. "Common in cultivated sandy ground, where it is uniformly found contorted, assuming the appearance of a very intricate knot."—*Templeton.*

11. **L. omilurus.**

Lumbricus omilurus = Omilurus rubescens, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.

Hab. "Common in rich grounds, generally where docks grow."—*Templeton.*

Desc. "Body long, contractile, cylindrical, with a compressed lanceolate apex, unfurnished with a belt at the position of the sexual organs, each ring with very small spines projecting backwards."—"I am not disposed to concur in the necessity of erecting this into a genus; but the characters separating it from the preceding species (*L. lividus*) are obvious enough. It is never larger than half the size of *L. terrestris*; and is of a bright reddish-brown, with the hinder part, or apex, very flat."—*Templeton.*

2. ENCHYTRÆUS, *Henle*, 1837.

Enchytræus, *Henle, Ann. des Sc. nat.* viii. 32; *Ann. Nat. Hist.* xii. 432. *Grube, Fam. Annel.* 103.

Char. Body filiform, smooth, white, rather indistinctly annulated, the segments from 30 to 70, armed with short spinets only in four small fascicles, which are quadriserial: spinets 3 or 4 in a fascicle. Terrestrial, living in a moist mould. Blood colourless. No muscular stomach.

1. **E. vermicularis.**

Lumbricus vermicularis, *Müll. Zool. Dan. Prod.* no. 2603; *Verm.* i. ii. 26. *Fabric. Faun. Grœnl.* 277. *Flem. Phil. Zool.* ii. 603. *Johnston in Zool. Journ.* iv. 421. *Dugès in Ann. des Sc. nat.* viii. 32 (1837).
Lumbricus putredinis, *Hardy in Proc. Berw. Nat. Club,* ii. 335.
Enchytræus vermicularis, *Grube, Fam. Annel.* 103.

Hab. In the soil under the bark of rotted trees, in decaying leaves, and at the roots of decayed vegetables: common.

Desc. Worm an inch in length, filiform, narrowed at both ends, white, smooth and glossy, annulose, the segments longer than their diameter, most distinctly defined at the extremities. Head obtuse, semiovate; the mouth inferior, between the first and second segments. Anal segment truncate, the vent round, wide and terminal. Spinets very short, proportionably stout, 3 to 5 in each fascicle. There is, on most specimens, a milk-white spot near the first third of the body, which seems rather to indicate the position of the stomach than to be a clitellus. The intestine is much convoluted and divided by strictures corresponding to those in the skin.

(*a*) Berwickshire, *Dr. Johnston.*

3. SÆNURIS, *Hoffmeister*, 1843.

Sænuris, *Hoffmeister, Ann. Nat. Hist.* xii. 432. *Grube, Fam.* 103.

Char. Body filiform, smooth, distinctly segmented, the segments separated by a simple line; armed with spinets only in four small fascicles, which are consequently quadriserial, a series along each side and one on each ventral margin: spinets slightly curved, from 3 to 9 in a fascicle, the segments towards each extremity having fewest: head a small conoid lobe: mouth between it and the second segment, eproboscidian: anus terminal. Blood red: no muscular stomach. Tenants of wet mud or sand.

* Freshwater.

1. **S. tubifex**, dorsal blood-vessel simple; tubicolous.

Sommerwormes, *Mouf. Theatr. Insect.* 325.

Vermes minimi rubri aquam stagnalem colore sanguineo inficientes, unde vulgus dira portendit, *Merret, Pinax*, 207.

Vers qu'on trouvent souvent rassemblés en grande quantité au fond de l'eau, *Trembley, Polyp.* 98, 99, 105 & 147. pl. 7. f. 2.

Vers qui se tiennent dans des fourreaux faits de boue, *Bonnet, Insectol.* ii. 208. pl. 2. f. 9, 10.

Small red Water-worms found plentifully in the mud of the river Thames, *Baker, Polype*, 62.

Lumbricus tubifex, *Müll. Zool. Dan. Prod.* 2605; *Wurm.* 102; *Verm.* i. ii. 27; *Zool. Dan.* iii. 4. tab. 84. f. 1, 2. *Bosc, Vers*, i. 255.

Lumbricus rivalis?, *Fabric. Faun. Grœnl.* 278.

Tubifex rivulorum, *Lam. An. s. Vert.* v. 225; 2de édit. iii. 676. *Blainv. Dict. des Sc. nat.* lvii. 497; *Atlas*, pl. fig. 5. *Templeton in Loud. Mag. Nat. Hist.* ix. 235. *Schweigg. Handb.* 590.

Freshwater Polypus, *Loudon's Mag. Nat. Hist.* v. 387-388 & viii. 620.

Sænuris variegata?, *Hoffmeister, De Vermib.* 9. t. 1. f. 29, t. 2. f. 19, 20, 21; *Ann. Nat. Hist.* xii. 432. *Rep. Zool. Ray Soc.* 1843, 510.

Hab. Common in shallow ditches with a bottom of fine mud, in which the worm constructs an erect cylindrical tube for its protection. Gregarious.

Obs. The worm is about one inch in length, and, in the water, appears of a deep red colour, but the immersed half is a pale straw-yellow. The skin is pellucid, and permits us to trace easily the course of the dorsal vessel and of the intestine, running tortuously from one end to the other, and making a twist in every segment. I have apparently seen only four spinets in the fascicles, and those of the ventral fascicles are longer than the others; but this requires re-examination. Oersted says that the superior bristles are partly hooked and partly capillary, and the inferior all hooked,—a peculiar structure, which would remove the species to another genus.

2. **S. vagans**, dorsal vessel simple; body composed of about 50 segments; 3 to 8 spinets in the fascicles; nomade. Length 6‴.

Lumbricus tubifex, var., *Müll. Zool. Dan.* iii. 5. tab. 84. f. 3, *a*, *b*, *c*.

Hab. In the soil under the moss on rocks over which water trickles.

Desc. Worm slender as a thread, filiform, incapable of shortening the body, reddish, the skin translucent and colourless, exposing the tortuous blood-vessel and intestine. The sides are crenulate under a high magnifier. Head obtusely pointed. Anal segment truncate, slightly emarginate, the vent wide and terminal. The spinets are colourless, slightly bent, acute at the apex, and much shorter than the diameter of the segment: they are in fan-shaped fascicles, and the number is greater in the ventral than in the dorsal series.

(*a*) Near Berwick, *Dr. Johnston.*

3. **S. variegata**, dorsal vessel with lateral cæca in each segment, forming a series of quadrangular spots on each side. Length 1–2″.

Vers longues aquatiques d'un brun rougeâtre, *Bonnet, Insectol.* ii. 6. pl. 1. f. 1–9. *Müll. Wurm-Arten*, 33 & 41.
Lumbricus variegatus, *Müll. Zool. Dan. Prod.* no. 2604; *Verm.* i. ii. 26. *Bosc, Vers*, i. 255. *Blumenb. Man.* 241. *Flem. Phil. Zool.* ii. 603. *Johnston in Zool. Journ.* iii. 326.
Nais variegatus, *Schweigg. Hand.* 590.
Lumbriculus variegatus, *Grube, Fam. Annel.* 101.
Lumbricus teres, *Dalyell, Pow. Creat.* ii. 140. pl. 17. f. 10–12.

Hab. Under dead leaves and in ditches, in wet places, or even in the water.

Obs. The most beautiful of its tribe, and readily distinguished by the character of the dorsal vessel which the pellucidity of the skin permits to be seen. The body is quite smooth, but under a high magnifier the sides appear finely crenulated. The extremities are frequently colourless. The spinets are very short, quadriserial.

** Littoral.

4. **S. lineata**, dorsal vessel simple, tortuous; segments about 40; anal segment sinuate. Length 6‴.

Der rothe Wurm, *Müll. Wurm-Arten*, 110; *der Faden-Wurm*, 118. tab. 3. f. 4, 5.
Lumbricus lineatus, *Müll. Verm.* i. ii. 29; *Zool. Dan. Prod.* no. 2606. *Fabric. Faun. Grœnl.* 278.
Nais littoralis, var., *Müll. Zool. Dan.* tab. 80. f. 1–4.
Saenuris lineata, *Grube, Fam. Annel.* 103.

Hab. In wet gravel or sand on the shore where the water is brackish.

Desc. Worm slender, slightly narrower at both ends, of a reddish colour to the naked eye, smooth, the sides neatly crenulated. Segments about equal in length to their diameter. Anal segment obtuse, deeply sinuate, mutable in form, for the little prominences which bound the sinus can be expanded or shut at pleasure. Spinets in four series, equidistant, from two to four in each fascicle, short, curved like an italic *f*, and sharp at the apex.

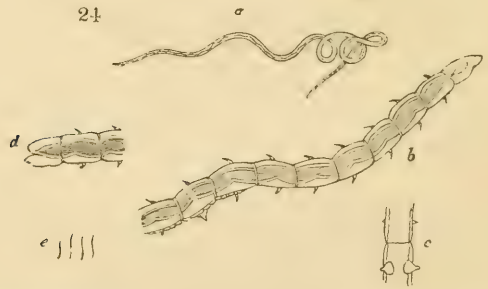
(*a*) Ferne Isles, Northumberland, *Dr. Johnston*.

4. CLITELLIO*.

Clitellio, *Savig. Syst. Annel.* 104. *Grube, Fam. Annel.* 103.

Char. Body filiform, smooth, distinctly annulated, pellucid, with a clitellus on the anterior third, and a pair of mammiform protrusile processes on the venter of one of its segments: head or first segment obtusely conical: mouth inferior: spinets uniform, in four series. Littoral.

No. II.—*Clitellio arenarius.*



a. Worm of the natural size. *b*. Anterior portion magnified.
c. A view of the ventral surface of the ninth ring, to show the mammiform process.
d. The anal segments. *e*. Bristles magnified.

* Agassiz writes it "Clitellis," and says it was established in 1817.

1. **C. arenarius.** (Fig. No. II.)

Lumbricus arenarius, *Müll. Zool. Dan. Prod.* no. 2614. *Fabric. Faun. Grœnl.* 280.
Lumbricus lineatus, *Johnston in Zool. Journ.* iii. 329; *and in Loud. Mag. Nat. Hist.* viii. 259. f. 24.
Lumbricus littoralis, *Dalyell, Pow. Creat.* ii. 139. pl. 17. f. 17, 18.
Clitellio arenarius, *Savig. Annel.* 104.

Hab. Between tide-marks in wet gravelly places, common.

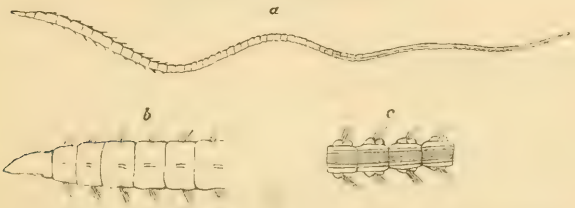
Desc. Body $1\frac{1}{2}$ inch long, or, when extended, nearly 3 inches, slender, slightly narrowed towards each extremity, of a fine pellucid red colour, or clear white, marked longitudinally with the red zigzag vessel, and often blotched with white and dusky spots from the interranea. Head pointed, the mouth in a sinus underneath. Segments longer than their diameter, bulged a little in the middle where the fascicles of spinets are inserted. Spinets very short, not half the diameter of the body, colourless, curved like an italic *f*; there are two only in the front and anal segments, and four where most developed (No. I. fig. 3). On the ventral surface of the 8th or 9th segment there is a pair of mammiform bodies surmounted with a minute tubular pap (penis); and this and the two or three adjoining segments are white and thickened so as to constitute a clitellus. Anal segment emarginate. There is a blood-vessel on each side of the intestine. When contracted the sides of the worm are minutely crenulate.

(*a*) Berwick Bay, *Dr. Johnston.*

5. VALLA.

Char. Lumbriciform, the body acephalous, distinctly annulated, flattish on the ventral aspect: first segment pointed: mouth inferior: segments crenulate, armed with setaceous bristles (No. I. fig. 5) in four fascicles; a segment (genital?) among those of the anterior portion of the body furnished with stout spines (No. I. fig. 4) in two fascicles: anus terminal, naked. Littoral*.

No. III.—*Valla ciliata.*



a. Worm of the natural size. *b.* Anterior portion.
c. Middle portion of body magnified.

* M. de Quatrefages would place this genus among the Annélides errantes, probably in the family Ariciadæ.—*Souv. d'un Naturaliste*, ii. p. 436.

1. **V. ciliata.** (Fig. No. III.)

Lumbricus ciliatus, *Müll. Verm.* i. ii. 30.
Lumbricus capitatus, *Johnston in Loud. Mag. Nat. Hist.* viii. 258. f. 23. *Dalyell, Pow. Creat.* ii. 138. pl. 17. f. 8, 9.
Lumbricus littoralis, *Johnston in Zool. Journ.* iii. 328.

Hab. The sea-shore in wet gravelly places.

Desc. This resembles a small earth-worm, 3 inches long, capable of extending itself to about 6, when the body becomes as slender as a sewing thread. It is not marked with a tortuous central blood-vessel; and is of a diffused red or reddish-brown colour mixed with the usual yellowish tint behind, and rendered dusky about the middle from the interranea. The ventral surface is slightly flattened. The head is narrow, and forms an elongated cone; but otherwise the anterior portion is always thickest; the remainder of the body is filiform, and becomes distinctly indented towards the posterior extremity. The head is partially retractile within the second segment. The first ten segments are broader but shorter than the succeeding, the 10th armed with several strong spines in two fascicles; the spines straw-yellow, faintly lineate near the base, cylindrical, with a slightly curved rather obtuse point (No. I. fig. 4). All the other segments are furnished with four fascicles of bristles directed strongly backwards, two on each side; and on the hinder segments they issue from small papillæ. The bristles are colourless, slender, flexible, straight or curved, the shaft cylindrical, a little thickened near the middle, whence it tapers to an acute point (fig. 5). They are most numerous on the anterior segments, which have from twelve to fifteen in each fascicle; the middle segments eight or nine; and the hinder not more than four or five. Anal segment small, cordate or somewhat lobed, with the vent between the lobes.

(*a*) Berwick Bay, *Dr. Johnston.*

The following species cannot be classified until they have been re-examined:—

Lumbricus minutus.

Lumbricus minutus, *Johnston in Zool. Journ.* iii. 328.

Lumbricus rufescens.

Lumbricus rufescens, *Johnston in Zool. Journ.* iii. 327.

Lumbricus? Clitellio? pellucida.

Lumbricus? Clitellio? pellucida, *Templeton in Loud. Mag. Nat. Hist.* vii. 131. f. 27 = Clitellio minutus, *Templeton in ibid.* ix. 235.

Lumbricus hirsutus.

Lumbricus hirsutus, *Dalyell, Pow. Creat.* ii. 140. pl. 17. f. 13–16.

II. NAIDINA.

Naidina, *Ehrenberg in Lam. An. s. Vert.* 2de édit. iii. 611.
Somatotoma, *Ann. des Sc. nat.* vii. 101 (1847) & 189.

Fam. III. NAIDES.

Nais, *Müll. Zool. Dan. Prod.* xxviii.; *Verm.* i. ii. 20.
Naides, *Cuv. Règn. Anim.* iii. 211. *Dugès in Ann. des Sc. nat.* xv. 319. *Williams' Rep. Brit. Assoc.* 1851, 218. *Oersted in Kroyer, Naturh. Tidssk.* 1843, 131. *Ray Soc. Rep.* 1845, 282.
Vers hispides, *Lam. An. s. Vert.* iii. 221.
Nais, *Blainville in Dict. des Sc. nat.* lvii. 497.
Naidea (—), *Grube, Fam. Annel.* 101.

Obs. The Naides are small pellucid vivacious worms distinguished from the aquatic Lumbricidæ by the flatness of the segments, furnished with comparatively long setaceous bristles; by having the front segment conformed into the likeness of a head; and by the two or three following segments being without bristles. In these respects the Naides approximate some of the errant Annelides, and differ so much from Scoloces that it has been proposed to segregate them as an order in their class, to be named Somatotoma. They are all strictly lacustrine, living amidst subaquatic plants, or, half-parasitical, within the shell of fluviate mollusca. They creep about actively, and can even swim. The bristles consist of spinets forked at the apex, and of setaceous bristles, always collected in small fascicles. The family is zoophagous; probably oviparous, but they multiply easily by spontaneous division.

6. PROTO, *Oken*, 1815.

Proto, *Oersted in Kroyer Naturh. Tidssk.* 1843, 133.
Dero, *Grube, Fam. Annel.* 105.

Char. Body furnished at the posterior extremity with from six to ten digitiform appendages: no eyes.

1. **P. digitata.** Length 5‴.

Nais digitata, *Müll. Verm.* i. ii. 22. *Wurm.* 90. tab. 5. f. 1–4. *Turt. Gmel.* iv. 91; *Brit. Faun.* 137. *Stew. Elem.* i. 391. *Bosc, Vers,* i. 239. *Penn. Brit. Zool.* iv. 98. *Blainv. Dict. des Sc. nat.* lvii. 498, *Atlas,* pl. fig. 1.
Proto digitata, *Oersted in lib. cit.* 133.
Dero digitata, *Grube, Fam. Annel.* 105.

Hab. In the sandy bed of rivulets.

Obs. The evidence on which this species has been introduced into the British Fauna is unsatisfactory.

7. STYLARIA.

Stylaria, *Lam. An. s. Vert.* iii. 223 (1816). *Ehrenberg in Lam. An. s. Vert.* 2de édit. iii. 612. *Oersted in lib. cit.* 133.

Char. Body linear, round, flattish in front: four first segments divided by a stricture from the body, and the first or head prolonged into a filiform appendage: eyes 2: superior bristles capillary, protruded; the inferior forked spinets.

1. S. lacustris.

Mille-pied à dard, *Trembley, Polyp.* 144. pl. 6. f. 1.
A very small and slender Worm, *Baker, Employm. Microsc.* 317. pl. 12. f. 24.
Nereis lacustris, *Linn. Syst.* 1085. *Rössel, Insect.* iii. 477. tab. 78. f. 15 *a*, 16, 17, 18 *g*, *h*, *i*; tab. 79. f. 1. *Penn. Brit. Zool.* iv. 46.
Nais proboscidea, *Müll. Wurm.* 14. tab. 1. f. 1–4; *Zool. Dan. Prod.* no. 2649; *Verm.* i. ii. 21. *Turt. Gmel.* iv. 91; *Brit. Faun.* 137. *Stew. Elem.* i. 390. *Blumenb. Man.* 246. *Penn. Brit. Zool.* iv. 97 (1812). *Blainv. Dict.* lvii. 498, *Atlas*, pl. fig. 3. *Dalyell, Pow. Creat.* ii. 131. pl. 17. f. 6, 7.
Stylaria paludosa, *Lam. An. s. Vert.* iii. 224; 2de édit. iii. 675. *Oersted, sup. cit.* 133. pl. 3. f. 5.
Stylaria lacustris, *Templeton in Loud. Mag. Nat. Hist.* ix. 235.

Hab. About the roots of aquatic plants.

Obs. Length 6–7‴; segments 60–70; the middle ones nearly twice as broad as long, regularly decreasing backwards; superior bristles twice as long as the breadth of the body, the inferior uncinate, with an incisure about the middle.

8. SERPENTINA.

Serpentina, *Oersted, lib. cit.* 134 (1843).

Char. Body linear, round, not flattened in front: the head anguiform, with a produced lower lip: eyes 2: superior bristles subulate, the inferior forked or uncinate.

1. S. quadristriata.

Nais serpentina, *Müll. Wurm.* 84. tab. 4. f. 1–4; *Verm.* i. ii. 20. *Turt. Gmel.* iv. 91; *Brit. Faun.* 137. *Stew. Elem.* i. 390. *Penn. Brit. Zool.* iv. 97 (1812). *Lam. An. s. Vert.* iii. 223; 2de édit. iii. 674. *Templeton in Loud. Mag. Nat. Hist.* vii. 130. f. 26 & ix. 235.
Serpentina quadristriata, *Oersted, Naturh. Tidssk.* 1843, 134, pl. 3. f. 3. *Rep. Zool. Ray Soc.* 1845, 282.

Hab. In ditches amongst duck-weed.

Obs. The spinets (inferior bristles) have a globular swelling a little below the middle. The superior are geminate, subulate, and strong. Length of the body 16–18″, composed of eighty to ninety segments: head marked with four dark transverse fasciæ.

9. NAIS.

Nais, *Lam. An. s. Vert.* iii. 222. *Leach in Supp. Encyclop. Brit.* i. 451. *Ehrenberg in Lam. An. s. Vert.* 2de édit. iii. 612. *Oersted in lib. cit.* 135.

Char. Body linear, subcylindrical, acuminate in front, truncate behind: head (= the three or four first segments) continuous with the body, not produced: eyes 2 or none: superior bristles capillary (sometimes uncinate), the inferior forked.

1. **N. scotica**, bristles shorter than the diameter of the body, fasciculate. Length 1″.

Nais lacustris, *Dalyell, Pow. Creat.* ii. 130. pl. 17. f. 1–5.

Hab. At the roots of subaquatic plants.

Desc. "Length an inch; body round; extremities obtuse; the anterior smooth and cylindrical, the portion behind it provided with a double row of thin tufts of prickles, some of them composed of several bristles. The extremities contain the mouth, and the termination of the excretory canal." "The mouth seems a dilatable cylinder without a proboscis."—*Dalyell.*

2. **N. filiformis.**

Nais filiformis, *Williams in Rep. Brit. Assoc.* 1851, 182 & 263.

Hab. Freshwater pools, abundant, *Dr. Williams.*

Obs. I cannot say whether this is a new species, or a Müllerian one under a new name. There is no description.

10. CHÆTOGASTER.

Chaëtogaster, *Baer in Nov. Act. Curios.* xiii. (1826). *Oersted in Kroyer's Naturh. Tidssk.* 1843, 138. *Zool. Journ.* iv. 258.

Char. Body cylindrical, truncate in front: eyes none: mouth terminal, barbed underneath on the first segment: bristles all spinets forked at the apex.

1. **Ch. vermicularis.**

Nais vermicularis, *Müll. Verm.* i. ii. 20. *Turt. Gmel.* iv. 91; *Brit. Faun.* 137. *Stew. Elem.* i. 390. *Penn. Brit. Zool.* iv. 97 (1812). *Lam. An. s. Vert.* iii. 223; 2nde édit. iii. 674. *Templeton in Loud. Mag. Nat. Hist.* ix. 235. *Dugès in Ann. des Sc. nat.* viii. 30 (1837), pl. 1. f. 21, 22.
Nais diaphana, *Gruithuisen in Zool. Journ.* v. 380.
Chætogaster Limnei, *Bäer in Nov. Act. Curios.* xiii. tab. xxix. f. 23.
Chætogaster diaphana, *Oersted, lib. cit.* 138. pl. 3. f. 2, 15 & 17.
Chætogaster vermicularis, *Grube.*

Hab. Amongst Lemnæ in ditches.

Obs. Body cylindrical, hyaline, 10–12‴ in length, of eighteen to

twenty obsoletely defined segments, the two first twice as long as broad, the others not so long as their diameter: mouth wide: bristles twelve underneath the first segment, in the other segments there are eight of lesser size.

I have implicitly followed Oersted in his arrangement and definition of the Naides, for I have not been fortunate enough to meet with a single species.

V. GYMNOCOPA.

Gymnocopa, *Grube, Fam. Annel.* 27.

Char. Body exannular, asetigerous, gelatinous, glauciform, with a series of compressed fins on each side: head distinct, tentaculated, with "a kind of bristles" in the setaceous tentacula. Sexes separate. Vascular system obsolete or very slightly developed. Swimmers. Marine.

Fam. I. TOMOPTERIDÆ.

Tomopteridea, *Grube, Fam. Annel.* 95.

Char. Body elongated, elliptical, with compressed fins, little developed or obsolete towards the posterior extremity: segments not numerous, and not divided by sutures. Head continuous with the post-occipital segment, furnished with frontal tentacula, and with very long lateral tentacular filaments, both containing a setiform portion: eyes 2: mouth ventral, edentulous. Fins or feet two-lobed, without bristles.

1. TOMOPTERIS, *Eschscholtz*, 1825.

Tomopteris, *Grube, Fam. Nat.* 96.
Johnstonella, *Gosse's Ramb. Devon. Coast*, 356; *see also Gray, Ann. & Mag. Nat. Hist.* ser. 2. xii. 150 & 199.

Char. The only genus.

1. T. onisciformis.

Tomopteris onisciformis, *Grube, Fam. Annel.* 96.
Johnstonella Catharina, *Gosse, Ramb. Devon. Coast*, 356. pl. 25.

Hab. The sea-coast of S. Devon, *P. H. Gosse.*

Desc. "Body $\frac{3}{4}$ inch long, $\frac{1}{6}$ inch in greatest diameter, flat, thin, as transparent and colourless as glass. Head dilated on each side into two lobes, which are flat, pointed, and leaf-like, extending laterally to a considerable distance. Along the posterior pair are soldered a pair of excessively long, slender antennæ, tapering to a fine point; they appear simple unjointed filaments, directed divergently backwards to a greater length than the body, and incapable of changing in direction. The basal moiety of their length is invested with a

loose skin, which corrugates into folds. Eyes two, black, small, on the summit of the head, between the posterior lobes: a line of minute black specks runs down the middle of the neck behind the eyes. Body narrow at each extremity, widening in the middle, furnished on each side with sixteen fin-like narrow lobes, each of which bears at its extremity two oval branchial? leaves set on obliquely. The ultimate pairs diminish gradually, and are succeeded by a few pairs of rudimentary processes on each side of a slender tail. Viscera:—a simple, clear, rather wide canal running through the whole length, ordinarily parallel-sided, but sometimes constricted so as to form a succession of spindle-shaped divisions, which pass from the head to the tail in rather slow pulsations, like the dorsal vessel of a caterpillar. A thick œsophageal proboscis was once protruded from the mouth, of an obconic form, with a large somewhat four-sided orifice obliquely terminal. No other internal structure was visible, notwithstanding the perfect transparency of the animal."

"Three specimens of the Johnstonella have come into my possession, all of which were dipped from the surface of the sea off the harbour of Ilfracombe, about the end of August. In a glass jar their motions were excessively vivacious; they swam with great swiftness by the rapid vibration of the lateral fins; so incessantly, that it was with the utmost difficulty I could examine them with the microscope. They darted through the water in all directions, across and around the jar; and when they rested, their translucency rendered them almost invisible. They soon died in captivity; I think I did not keep one of them longer than the second day."—*P. H. Gosse.*

"The animal described by Mr. Gosse under the name of *Johnstonella Catharina* appears to belong to the same genus as the animal described by Eschscholtz in the 'Isis' (1825), p. 736. t. 5. f. 5, under the name of *Tomopteris onisciformis* from the South Seas; and by MM. Quoy and Gaimard in the 'Voyage of the Astrolabe,' ii. p. 284. t. 21. f. 21, 24, under the name of *Briaræa Scolopendra* from the coast of Spain. Hermannsen has proposed to change the latter name to *Briaræa*: Harry Goodsir calls it *Briareus*: and Mr. R. Ball writes it *Bryarea*. Eschscholtz and Quoy and Gaimard regard it as a mollusk; the first referring it to the order *Heteropoda*, and the latter to the *Nudibranchiata*.

"Mr. Harry Goodsir, who found the animal abundant in the North Sea (Ann. and Mag. Nat. Hist. 1845, xvi. 163)," observing the presence of "cilia fringing the bifurcated posteriors of the lateral extremity of its body," decided that it could not be a mollusk.

"Menke (Zeitschr. für Malac. 1844, p. 21) proposes to remove the genus to the Annelides; more recent authors have considered it as a Crustacean.

"Mr. Gosse at first sight thought it might be a Brachiopod Crustacean, but thinks it has more affinity to the Annelides (p. 348), and refers it to that class in the Systematic Index.

"According to Eschscholtz and Quoy and Gaimard, the South Sea specimens are very much smaller than those found in the Mediter-

rancan: thus, *Tomopteris onisciformis* and *T. Scolopendra* are most probably distinct species. Mr. Gosse's *Johnstonella Catharina* is, no doubt, a synonym of the latter, since Mr. R. Ball records that *Bryarea Scolopendra* has been taken in Dublin Bay by Dr. Corrigan (Report Brit. Assoc. 1849, p. 72)."—*Gray, Ann. & Mag. Nat. Hist.*

The **Nereis phasma** of Dalyell (*Pow. Creat.* ii. 260. pl. 36. f. 16, 17, & 11) is a second species, apparently, of this singular and beautiful genus. Sir John procured his specimens in the Firth of Forth at Newhaven, and on the Isle of May; and he thus describes the animal:—"This animal is towards an inch in length. It might be inscribed in a triangle. The head is forked or cleft, furnished with two long antennæ issuing from the sides, between the roots of which, or somewhat behind them, are two black eyes, rather oval, and probably compound. If the body is divided into segments, they are invisible from transparence. If so, the segments consist of a central portion, as the central part of the Nereis, and a long arm, an integral part towards each side, gradually shortening from the middle to the lower extremity, which is pointed. Towards this extremity they degenerate into mere stumps, which seem to be successively developed as arms. Sixteen or seventeen of these arms were conspicuous in (one example), and fourteen or fifteen in (another). In some others were four or five or seven pair of limbs or arms. The extremity of the limb is cleft, and terminates in two portions like hollow walnut shells. To some of the artists the termination seemed a pencil. An intestinal organ traverses the whole length of the body.

"This animal is absolutely colourless; it can be distinguished from the water only when in particular positions, and under a particular incidence of the light. It swims horizontally, and then partly by faint undulations. In this position the greater convexity of the back, and slighter convexity of the belly, are sensible. It always seeks the higher part of the water, near the surface, like the Medusæ, keeping the antennæ recurved. I sometimes believed that segments were indicated on the under surface; that the whole was crossed by wrinkles which were effaced on extension; and one of the cleft extremities of the limb also seemed to move as if by a joint; and the hollows of some contained a minute yellow body like an ovum. The animal is rather of a gelatinous appearance. It can be preserved with difficulty, from being liable to entangle itself in every foreign substance, and is easily mutilated in its struggles for liberation."—*Dalyell.*

Order VI. ANNELIDES.

Chetopodes (—), *Blainv. Princip. d'Anat. Comp.* i. tab. 7. sp. 177.
Annelides, *De Quatrefages in Ann. des Sc. nat.* viii. 99 (1847).
Annulata appendiculata polychaeta, *Grube, Fam. Annel.* 26.

Char. Worms segmented, the segments forming a section of a cylinder or semicylinder, and furnished on each side with prominent lobular or wart-like feet armed with many retractile bristles of various kinds, in one, two, or three fascicles: head either distinct with organs of sense, or indistinctly defined with tentacular filaments on its crown or sides: branchiæ variously attached, usually combined with the feet, filamentary, foliaceous, or arbuscular, rarely obsolete or cutaneous: anus opposite to the mouth, terminal, and usually protected with styles or lobules. Blood red or green, circulating in close vessels: respiration aquatic: zoophagous or geodephagous: the sexes separate or united in the same individual: marine or littoral.

It may be useful to give a brief explanation of the nomenclature employed.

The Body is the entire worm. The form is defined by familiar words, in general used in their common acceptation, but it is convenient to call it *lumbriciform*, when it is nearly cylindrical, like the Earth-worm; *scolopendriform*, when it is flattened on both dorsal and ventral surfaces with nearly parallel sides, like the Centipede; and *eruciform*, when it is thickish in proportion to its length, and grub-like.

The body is formed of a specific number of Segments developed in longitudinal succession, and divided from each other by a plain suture. They are annular; and subdivided sometimes into *rings* by circular folds of the skin.

The Segments are *similar* when they resemble each other in structure generally; and they are *dissimilar* when some vary from the others in any addition, or abstraction of organs.

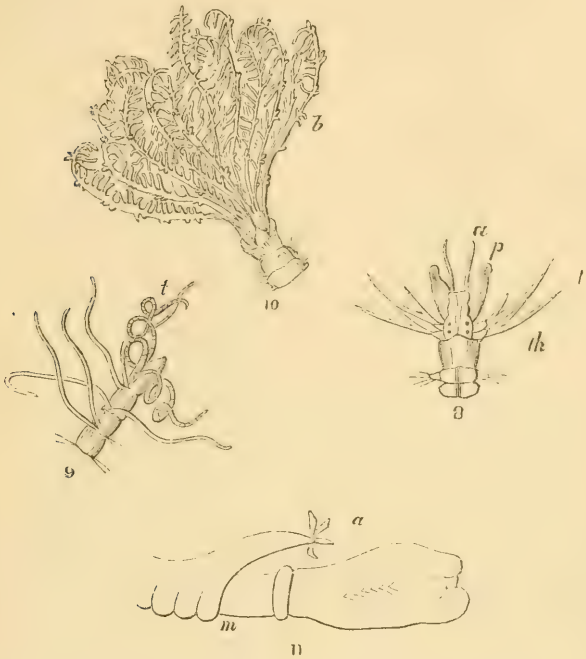
The Segments are of three kinds more or less distinctly marked, —the *cephalic*,—the *thoracic*,—and the *abdominal*.

The *Cephalic* is that portion of the body anterior to the first transverse suture. It may be composed of three or more segments in a more or less intimate union, but the demonstration, however useful in theoretical, is useless in descriptive anatomy.

When the aspect of the *cephalic* portion is such that we cannot call it otherwise than a head, the worm is said to be *cephalous* (No. IV. fig. 8); when it differs little from the other segments behind, and appears almost a continuation of them, it is *subcephalous* (figs. 9, 11); and when there is no appearance of a head, and the front terminates abruptly, the worm is *acephalous* (fig. 10).

The Head (fig. 8) has various appendages. There are usually one or two pairs of *eyes* placed on the dorsal aspect behind the

No. IV.



antennæ. In the subcephalous and acephalous tribes eyes are generally absent. They are always sessile, simple, and immoveable.

Antennæ (figs. 8 *a* & 11 *a*) exist only in cephalous genera. They are soft, setaceous filaments, varying in number from one to five, and distinguished from the other appendages by arising directly from the head. They are usually jointed at the base, and are not retractile.

Palpi (fig. 8 *p*) are seldom found. They are also soft filaments, entire or jointed, and originate externally from the sides of the oral orifice.

Tentacula (figs. 8 *t* & 9 *t*) are the soft setaceous or filiform non-retractile processes which arise from each side of the cephalic segments in pairs, and spread laterally. They are sometimes jointed; often very long, and remarkably contractile in the acephalous genera.

The *Mouth* (fig. 11 *m*) is underneath the head, and is a round or transverse entrance to the œsophagus and intestinal canal. It has usually a plain margin. In the acephalous genera it is terminal and emaxillary, but occasionally furnished with external tentacles. In the subcephalous it is subterminal or ventral; and in the cephalous nearly terminal, looking forwards horizontally.

The Mouth in the cephalous tribe is almost always furnished with

a *Proboscis*, viz. the œsophagus, or upper portion of the intestinal canal, in a state of protrusion. It consists of one or two segments, and is evolved at pleasure by a process of evagination. It is often armed with horny jaws in opposite pairs; sometimes roughened on the surface with horny prickles; sometimes villose with soft papillæ; sometimes encircled at the orifice with soft papillæ or short tentacles; and sometimes plain. These modifications of the organ afford important characters in classification.

The *Thoracic* Segments immediately succeed the cephalic or head. In the cephalous genera there is only one thoracic segment (fig. 8 *th*); as is also the case in many of the subcephalous. From its position, I usually describe it as the post-occipital,—a name to be preferred as implying no theory. It is remarkable for being naked,—that is, it has no soft appendages or setigerous feet, and constitutes, sometimes, a sort of neck.

In the acephalous genera, and less markedly in some others, the thoracic segments are distinguished by peculiarities in their structure and appendages;—they are more fleshy and contain the primary organs of life; and to them the Branchiæ (fig. 10 *b*) are limited in many genera. They are readily enough defined.

The *Abdominal* Segments follow the thoracic and complete the body. They are more numerous than the cephalic and thoracic combined, more uniformly alike in their appendages, and liable to vary in their number, so that, as a character, number is here of no value, excepting in a few instances. They gradually lessen in size as they approach the posterior extremity; and the last segment is called the *anal*. This has no setigerous feet, often no soft appendages, but more commonly a pair of soft filaments, called *styles*, project behind; or a series of short papillæ surround the vent, which is terminal and central.

The *Segments* are furnished with various appendages, which are precisely similar on each side, but modified more or less on different segments. Of these appendages the Foot is the principal, and with it the others are commonly combined.

The *Foot* is a papillary projection on the side of the segment for the insertion of the bristles. It also affords, in most worms, a basis of attachment to the Branchiæ, and certain soft setaceous filaments called *Cirri* or tentacular cirri.

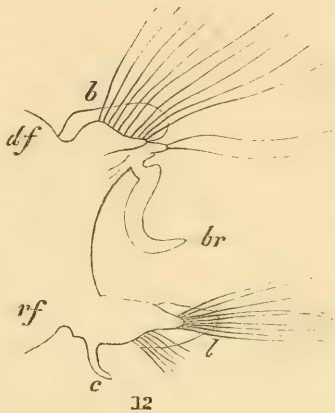
The Branchiæ are the breathing organs. In the cephalous and subcephalous families they are attached to the base of the foot on the upper or dorsal side, either restricted to a certain number of segments, or found on all of them. They vary much in form. They are either arbuscular, or semipectinate, or flat and veined, when their function is indisputable; or they are filamentary, or squamous, or lobe-like, or merely tubercular, when the ascription of the function becomes arbitrary, or a deduction from the theory of homologies and degradation of organism. In many acephalous genera the Branchiæ are placed on the crown in beautiful tufts (fig. 10); and in all acephalous worms the function of the organs is never doubtful. They often combine a tactile with the respiratory office.

The *Cirri* are the tentacula of the body; and we may call them,

in some genera, tentacular cirri from their similarity to the tentacula on the sides of the head. They are simple, soft, tapered filaments or papillary processes attached to the dorsal and ventral lobes of the foot, at or near the base. Their office appears to be tactile.

The *Foot*, properly so-called, is the papillary process, tubercle, or fold in which the Bristles are sheathed. When the process is single and undivided, the foot is said to be *uniramous*; when it is divided into two lobes, it is *biramous* (No. V. fig. 12). The upper division is called the *dorsal branch*, and the inferior the *ventral branch*. They are more or less apart,—sometimes so near as to coalesce, and not to be distinguished from the uniramous excepting by the presence of two bundles of bristles,—sometimes so wide asunder that they seem to have no connexion. Of the latter the foot of the Nephthys is a good example (fig. 12). In this figure *df* is the dorsal branch, and *vf* the ventral branch armed with their long bristles; *l* are the compressed lamellæ attached to the foot; *br* are presumed to be the branchiæ; and *c* is the inferior cirrus; and, in this species (*N. longisetosa*), there is no superior cirrus. This interpretation of the organs appears to me erroneous. The function of the sickle-shaped process is entirely conjectural; and surely the compressed lamellæ are branchial, although undoubtedly the function is not confined to them.

No. V.



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Bristles.—There are four kinds of bristles connected with the feet, viz. the Spine, the Spinet, the Bristles properly so called, and the Hooklets. Other bristles which belong to the body will be noticed under the genera in which they occur.

1. The Spine (Plate III. fig. 1) is subulate and straight, tapering insensibly from the base to the point. It is always associated with the bristles, there being one, or at most two, in the centre of each fascicle; and it is readily distinguished by being stouter and dark-coloured. It is not protrusile. Audouin and Milne-Edwards say that the base is placed in the bowl of a little cup; but certainly this is not usually the case. The basal portion is lighter-coloured than the upper.

2. The Spinet is not in general so stout as the spine, neither is it dark-coloured. It is found only on a few feet in some genera, and in most is absent. It is associated with the bristles, and is known by being stiffer and stouter, and different in shape. The apex is forcipate (Pl. III. fig. 2), or forked (figs. 3, 3*, 4, 5).

3. The Bristles are simple or compound.

The simple Bristle is formed of a single continuous piece. It is always fasciculate. It varies much in strength and size and figure;

and two or more kinds are often found coexistent on the same foot. The forms may, perhaps, be reduced to the following:—

Capillary.—Slender, flexile and hair-like, as *e. g.* the coloured hairs of *Aphrodita aculeata*.

Setaceous, slender and tapered insensibly from the root to a sharp point (Pl. III. figs. 6, 7).

Lanceolate, straight on the lower half, bulged about the middle, whence it tapers to a point sharp on both sides (figs. 10, 11, 13, 14).

Ventricose.—When the shaft is enlarged on one side (figs. 8, 9).

Tarsiform.—A stout bristle terminating in a point curved and sharp like a claw (figs. 17, 18, 19). This is common in the Aphroditaceæ. It is somewhat grooved and denticulate on one side.

Spinous.—A stout bristle resembling the spine or spinet, but distinguished by being fasciculate (figs. 21, 22). It is more or less flexuose or bent like the letter *f* (fig. 23) in many subcephalous annelids; and is dark-coloured and straight in *Aphrodita aculeata*.

The compound Bristle is peculiar to the "Annelida rapacia." It is a bristle of which the shaft is broken into two halves by an imperfect sort of joint. The lower portion is the shaft, and the upper the terminal piece. (See Pl. IV.)

The intermediate joint may be simply oblique with the edges approximate (Pl. IV. fig. 1), or separate (figs. 4, 5), or with the shaft and terminal piece attached merely by a point (fig. 11). Or the two pieces may be connected by a mortise joint (fig. 7), or by a variously formed socket (figs. 2, 9, 13).

The shaft is usually straight, smooth or serrulate, and a little enlarged towards the outer end. The terminal piece varies in shape like the simple bristle. It is *acicular* when it is straight and slender, and tapers to a very sharp point (Pl. IV. fig. 7).

Tarsiform.—When it is elongated and slightly bent, and brought to a point, like the hind claw of a small bird (Pl. IV. fig. 1).

Falcate.—When the piece is short, and curved at the apex so as to resemble the mandible of a small bird (Pl. IV. figs. 2, 6, 12).

The British species are divided into the following Tribes:—

Tribe I. Rapacia. Animal-killers.

Body with soft appendages, generally disposed on the whole length of the body. Feet distinct, armed with setæ, which are sometimes hooked. Head generally distinct, provided with eyes, antennæ, a retractile proboscis, and often with jaws. Living on marine animals.

Tribe II. Limivora. Mud-eaters.

Body with the soft appendages collected together at the cephalic extremity. Feet of two kinds, generally deprived of cirrhi, and armed with hooked bristles. Head not distinct, without eye-tentacles. Protractile proboscis or jaws. Eating mud and the dead animals and vesicles it contains.

VI. ANNELIDES.

I. RAPACIA.

Scolopendræ marinæ, *Jonst. de Insect.* lib. iv. 205.
Scolopendres de mer, *Rond. Hist. Poiss.* ii. 74.
Nereides vagæ, *Pallas, Misc. Zool.* 113.
Dorsibranches, *Cuv. Règn. Anim.* iii. 197.
Anneleides, *Leach in Ann. Phil.* xiv. 205 (1819).
Annelides antennées, *Lam. Anim. s. Vert.* v. 302.
Notobranchia, *Latreille, Fam. Nat.* 238.
Nereidina, *Macleay in Murchison's Silur. Syst.* ii. 699; *and in Ann. Nat. Hist.* iv. 385.
Ann. errantes, *Aud. & M.-Edw. Litt. de la France,* ii. 27.
Dorsibranchia, *Griffith's Cuvier,* xiii. 7.
Dorsibranchiata, *Griffith's Cuv. Syst. Ind.* lix. *Jones, Anim. Kingd.* 189 & 212.
Annélides errans ou dorsibranches, *M.-Edwards, Elem. de Zoologie,* 222.
Annelida errantia, *Ann. & Mag. Nat. Hist.* xiv. 32.
Annelides nereideæ, *Savigny, Syst. Annel.* 7.
Maricolæ, *Oersted, Ann. Dan. Consp.* 2.
Rapacia, *Grube, Fam. Annel.* 30.

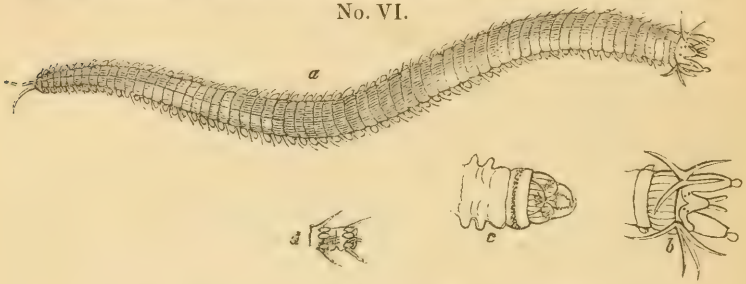
Char. "Body with soft appendages (cirri, branchiæ or antennæ), generally disposed over the whole length of the animal, and not collected towards the cephalic extremity. Feet generally very distinct, armed with setæ or bristles, which have very rarely the form of hooks. Head generally distinct, and provided with eyes, antennæ, and a retractile proboscis, often with jaws."—*Milne-Edwards.*

Obs. Organized for locomotion, this tribe of Annelides—the tyrants or the aristocracy of their race—wander abroad, and are in constant warfare with all around them. They crawl on the surface at a pace that varies in the species from extreme slowness to energetic activity. Many of them swim with ease; and others burrow in the wet sand of the shore. A few construct tubes or cases for their residence, but these are not essential to the existence of the tenant, and can be vacated at pleasure. They are eminently carnivorous, with the exception, perhaps, of the Ariciadæ, which may be geodephagous or feeders on putrescent matter. The sexes are separate so far as is known; and the female is oviparous. The young undergo a certain metamorphosis which tends to higher development of the organs.

Lost portions are restored with facility. A few secrete a luminous fluid, but an organ appropriated to the secretion has not been demonstrated. The skin is very generally margaritaceous or iridescent; and this is occasionally the case also with the bristles.

1. *General Form.*—The Annelides have an elongated worm-like figure, which, in some genera, inclines more or less to an oblong or

No. VI.



a. Animal. *b.* Head. *c.* Jaws. *d.* Rings.

oval. The *Nereides* offer examples of the vermiform species (No. VI.); the *Polynoë*, and, more especially, the *Aphrodites*, may be instanced as examples of the latter. The length is often considerable. On our shores species are to be found nearly two feet in length, and as thick as the barrel of a large quill; but in equatorial seas some attain the length of five feet with a diameter of thirteen lines.

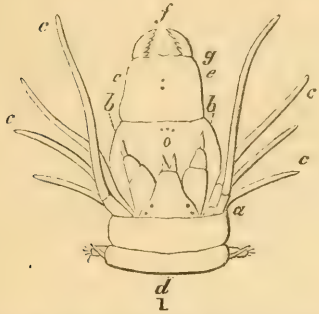
2. *Body.*—The body is composed of narrow segments or rings (No. VI. fig. *d*), not calcareous nor even corneous as they are in the great majority of crustacea and insects, but membranous, and merely separated by a fold of still thinner membrane, such as we observe in many larvæ and caterpillars, so that it is occasionally difficult to mark their exact limits. The number of the rings is in general very considerable, and proportionate to the length of the body, for the growth of this in length depends much more on the production of new segments than on the development of any one in particular. There are great differences in the number of rings necessary to complete maturity. In some *Polynoë* there are not more than from 20 to 30 rings; in *Phyllodoce lamellata* not less than 500. In the species which have few rings, as in *Aphrodite* and *Polynoë*, the number appears to be specifically limited, and the same in all the individuals; but in the *Nereides* and others nothing is more variable, and less to be relied upon as a discriminative character. This variety depends on age, on circumstances more or less favourable to growth, and on the effects of injuries.

3. *Head and Appendages.*—The first segment forms a head more or less distinct (No. VII. fig. 1). On the upper or dorsal surface of this head there are usually one or two pairs of black specks, believed to be eyes* (fig. 1, *a*). The head bears also usually a

* Blainville doubted whether they were eyes (Dict. des Sc. Nat. xlvii. p. 210). But Müller believes them to be really visual organs, for they have nerves from the brain, the form of eyes, and are provided with a black pigment. He admits,

certain number of conical or filiform appendages, which we distinguish into antennæ, palpi, and tentacula. The antennæ are directly

No. VII.



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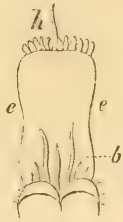

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attached to the head, and their insertion is always superior (fig. 1, *o*; fig. 2, *b*). The palpi are more connected with the mouth, and their insertion is inferior (fig. 1, *b b*)*. The tentacula (fig. 1, *c c*) are filiform organs inserted, in pairs, on each side of the head, and of the post-cephalic segment, when this is apodous.

4. *Mouth.*—In the Annelides with a head obscurely defined, as, for example, in the *Tubicoles,* the mouth is usually terminal; but in all the cephalous genera it is on the ventral or inferior aspect. It is either a simple wide aperture, or it is furnished with a proboscis (fig. 1 and fig. 2, *e*, *e*), which can be extruded at the will of the animal, although it is kept retracted and concealed in the state of quiescence. It may be considered as simply a portion or continuation of the alimentary canal. It is often armed with horny jaws

however, that they do not contain any transparent parts, and are not furnished with any optical apparatus: they are simple swellings of the optic nerves, surrounded with a black pigment, sensible to light, and enable the worm to distinguish between light and darkness,—between places which lie in shade and those which are exposed to the glare of day; but not imparting the power of recognizing the shape, or colour, or texture of bodies.—Ann. des Sc. Nat. tom. xxii. p. 25. See also in favour of their being eyes, Bourjot in Microsc. Journ. i. p. 77; and Cuvier in Analyse des Travaux de l'Acad. Roy. des Sc. 1828, p. 82, &c.; De Quatrefages in Ann. des Sc. Nat. iv. (1845) p. 178. But M. de Quatrefages has found in some species, especially in *Torrea vitrea,* eyes that have a crystalline lens, a choroid coat, a vitreous humour, a transparent cornea, &c. "Some Annelida have other eyes besides those on the head. M. Quatrefages believes that he has discovered them upon the branchiæ of the Sabellæ, and he has no doubt that the red points which we find upon the sides of each ring in several Annelida of the genus *Nais* are true eyes; there is, however, nothing surprising in this, when we recollect the very great independence existing between the various rings of which the body of these animals consists."—Ann. & Mag. Nat. Hist., Ser. 2. vi. p. 228.

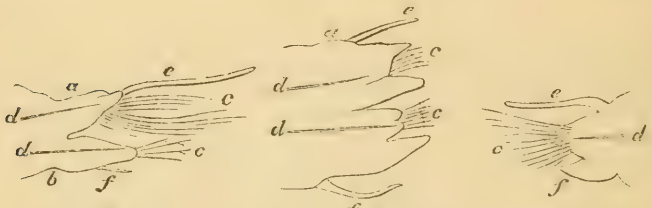
* Audouin and Milne-Edwards call the central organs median antennæ, and the palpi external antennæ; but our nomenclature does away with the adjective, and the structure of the organs would seem to indicate a difference in their functions.

(fig. 1, *f*) that indicate the power and cruelty of the species. No acephalous Annelid has jaws of such strength; and few have any organs of the kind. The proboscis is occasionally roughened with small horny prickles collected into clusters (fig. 1), or clothed with minute fleshy papillæ; and its orifice is either plain or encircled with tentacles (fig. 2, *h*).

5. *Feet.*—In the majority of Annelides there is a foot on each side of every ring which is armed with bristles, and provided with certain soft appendages to which the names of cirri, branchiæ, and scales have been applied*.

The foot in general is composed of two parts or branches placed one above the other. These branches are sometimes wide asunder, and easily to be distinguished into a dorsal or superior (No. VIII. figs. 3, 4, *a*), and a ventral or inferior branch (*b*); but sometimes, on

No. VIII.



the contrary, they are intimately united, and appear to have coalesced in one (fig. 5)†. Each branch is provided with a brush of bristles (figs. 3, 4, 5, *c*), which the animal can protrude considerably from the outer or distal end.

The bristles are of two kinds,—the subulate and the hooked.

The subulate bristles are distinguished into bristles (festucæ) properly so called (figs. 3, 4, 5, *c*), and into aciculi or spines (*d*). The former are either grouped in brush-like bundles or arranged in a fan-like series: their shape and structure are very variable. The spines are stouter than the bristles, always straight and needle-like, and deeper coloured. There is only one to each brush of bristles, and it is enveloped in a proper sheath.

The hooked bristles (uncinuli, No. X. fig. 9 *b*) are never met with on the two branches of the same foot: they exist only in the *Tubicoles*, and their presence is always coincident with a head indistinctly developed or obsolete. They are disposed in one or two series, and occupy the margin of a transverse fold or of a slightly raised mamilla. Their arrangement in a more or less oval ring has given occasion to

* On the structure of the foot, see De Quatrefages in Ann. des Sc. Nat. x. (1848) 51.

† I prefer to call the divisions of the foot branches rather than oars, as Savigny and Blainville call them; for the Annelides "with reptile motion creep," and do not swim except when placed in untoward circumstances. Oersted names the feet "pinnæ," and each has its "pinna superior v. dorsalis," and its "pinna inferior v. ventralis."—Consp. Ann. Dan. p. 5.

a comparison of them with the stigmata of insects, and they have been even mistaken for true respiratory spiracles; but it would be more correct to compare them with the hooked bristles that garnish the prolegs of caterpillars, and are subservient to progressive motion.

In most Annelides the feet are essentially the same in structure throughout the body. In those which have hooked bristles, the feet furnished with them are found only on a certain portion of the segments, and the feet of the other rings are armed with bristles properly so called.

6. *Cirri.*—The cirri have often the form of long subulate fleshy tentacles (No. VIII. figs. 3, 4, 5, *e*, *f*), but sometimes they are merely small compressed leaflets or papillary tubercles. In general they are partially contractile; and some have a ringed or moniliform appearance. The cirri of the anterior segments, in which the feet are obsolete or wanting, are, as has been already mentioned, called tentacular cirri, or simply tentacula. The anal segment is equally apodous, and the cirri which issue from its end are named styles (No. IX. fig. 6, *a*).

No. IX.

6

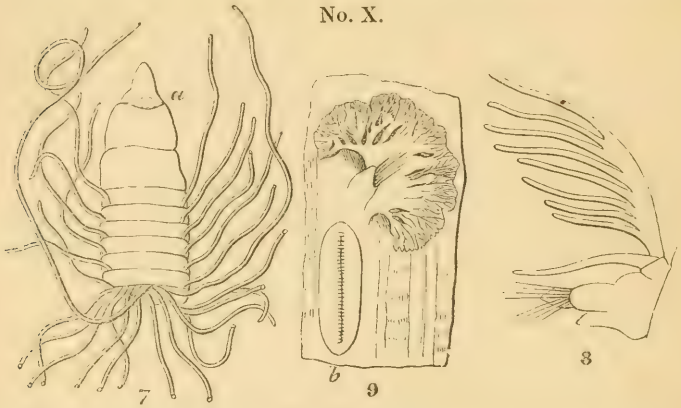
The proper cirri are usually two to each foot, originating near the base of each branch, and hence they are distinguished into the superior (figs. 3, 4, 5, *e*) and the inferior cirrus (*f*). The cirrus may arise, however, from the apex of the dorsal branch; and there are Annelides in which so many as seven pairs are to be counted on a single ring; but in these instances they represent all the other fleshy appendages. The cirri are almost always absent in the Annelides whose feet are coronated with hooked bristles; and also from those whose feet consist merely of a few bristles without any protuberant papillary base.

7. *Branchiæ.*—The structure of the organs so designated permits, in some instances, no doubt to be entertained as to the functions they are destined to fulfil. Such is the case when the organ is in the form of a little crimson arbuscle, or in tufts or fan-shaped crests (fig. 9); but when it is a simple or a pectinated filament (No. X. figs. 7 & 8), or a nipple-like lobe, or merely a membranous tubercle, there is no organic character to distinguish them from cirri, and their function is less decided*. In number and position the branchiæ are as variable as in their figure, and they are placed either on the head, or along the back, or along the sides, or at the tail. M. de Quatrefages arrives at the following conclusions as to the respiration of the Annelides:—"1. Respiration general and entirely cutaneous (*Lumbriconereis*).—2. Respiration cutaneous, but confined to certain segments (*Chætopterus*).—3. Respiration cutaneous, but confined to certain points of each segment (*Nereis*).—4. Respiratory organ taking the form of a simple cæcum or bladder into which the blood

* It is true in general that the appendages of the anterior rings tend to take a dorsal position, and those of the posterior rings a ventral position. The branchiæ are always superior to the other appendages of the foot, or dorsad; and, in doubtful cases, the nature of the organ may be presumed from the position it occupies.

flows (*Glycera*).—5. The branchia is characterized more and more by the formation of a canal in communication with larger or smaller

No. X.



lacunæ.—6. These branchiæ may be distributed all along the body (*Eunice sanguinea*).—7. They may be confined to a certain number of segments placed towards the middle of the body (*Arenicola, Hermella*).—8. They may all be placed at the extremity of the body so as to form a double tuft (*Serpula*)*."

8. *Scales*†.—The scales are found only in a few genera. They have always a dorsal position, and seem to occupy the place of the superior pair of branchial appendages rather than the superior pair of cirri. Their texture is softish, and the margin is sometimes partially fringed with short filaments or fleshy cilia (No. XI. fig. 10*a*). In general the scales are placed over only such feet as are destitute of cirri, and alternate with these appendages,—an arrangement which has suggested the theory of their being modifications of the latter; but the genus *Sigalion* offers an exception, for here the two organs coexist on one and the same foot, and supplies a fact to disprove the opinion of their being the analogues of the superior cirrus.

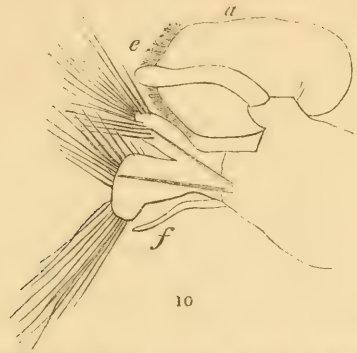
9. *Suckers*.—There is no instance of a species of Polypodous Annelid with a sucker either at the anterior or posterior extremity.

* Ann. & Mag. Nat. Hist. Ser. 2. ix. p. 155. See also Williams in lib. cit. xii. p. 393.

† Called *elytra* by Savigny, whose nomenclature is followed by Audouin and M.-Edwards,—but the term is very unsuitable. "Savigny is of opinion that certain dorsal scales, in pairs, observable in two of the genera of his first family of Nereïdeans, are analogous to the elytra and wings of insects: this he infers from characters connected with their insertion, dorsal position, substance and structure, but not with their uses and functions; for, as he also states, they are evidently a species of vesicle, communicating by a pedicle with the interior of the body, which, in the laying season, is filled with eggs, a circumstance in which they agree with the egg-pouches of the Entomostracans; and, therefore, Baron Cuvier's opinion, that there is little foundation for the application of this term to these organs, seems to me correct."—Kirby's Bridgew. Treat. ii. p. 145.

It is true, that the body of the *Clymene*, a genus furnished with feet, is terminated posteriorly by a sort of concave membranous disk, in

No. XI.



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the centre of which the anus opens; but it is ascertained that that disk, though dilatable, cannot execute the office of a sucker.

10. *Anus.*—The anus is inclined to the dorsal surface and looks upwards. Dr. Williams says—"There exist other minor families of Annelids in which the terminal outlet of the alimentary system is not seated at the extreme end of the body, but at a point, at the side, more or less removed backwards from the head, resembling intimately the pattern on which that of the Sipunculidæ is formed*."

The *Annelides rapacia* are the most complicated in organization of any of their class. As the ordinal name implies, they are a wandering tribe, and the locomotive apparatus is so much developed, that the species are enabled to creep with considerable quickness, and even to swim with facility. Some of them, as certain *Amphinomes*, appear to be truly pelagian, and are only met with in the high seas; but the great majority dwell between tide-marks on the shore, where they find refuge and concealment under stones, or among corallines and sea-weeds. A small number burrow in the sand (*Nephthys*, *Arenicola*, &c.), in which they form a sort of sheath by a glairy secretion from the skin; and a few are truly tubicolous; but these furrows are not indispensable, and can be occasionally abandoned without inconvenience. The greater number of the Order are provided with special organs of sense considerably developed; and they have organs of defence in the shape of bristles of curious structure. All of them are inhabitants of the sea or its shore, and only a very few trespass on tidal rivers, not fearing the influence of brackish water. None of them are parasites. Some species may frequently be observed watching in patient solitude, and ready to launch upon weaker worms, mollusks, or other animals on which they prey; but none offers us any instance of the singular instinctive contrivances which surprise us in the study of insects. Several of

* Rep. Brit. Assoc. 1851, p. 220.

them lose with impunity their exterior organs, and even considerable portions of the body, reproducing the lost parts in a short time under favouring circumstances. The anterior half will reproduce the posterior, and that will return the favour by restoring the anterior with the head and all its organs. But if the body is cut into several pieces, it has not been proved that the separated pieces can live, and become each a perfect worm.

In general the *Annelides rapacia* have a serpentine or myriapod form, but some are oblong or oval. The body is almost always terminated anteriorly by a distinctly defined head furnished, with few exceptions, with eyes, and with antennæ,—a collocation of parts which is not met with in any other order of the class. Underneath the head, and at its junction with the first ring of the body, we find the mouth (No. X. fig. 7*a*), which is, in some cases, prolonged backwards and buttressed by the feet. The proboscis is composed of one or two rings; it is very often armed with jaws, and not unfrequently the orifice is encircled with papillary filaments (No. VII. fig. 2).

There is a series of feet along each side of the body, having the form of fleshy tubercles, more or less protuberant. These organs are sometimes simple or uniramous,—sometimes bifid, with a dorsal and a ventral branch. The apex of the branch is always the outlet of a brush of bristles, which can be thrust out, and again withdrawn, to a certain extent at least, into the ring, by certain muscles appropriated to that use. These bristles are sharp, rather firm organs, very variable in regard of figure and conformation in different genera, and each brush has a spine in its centre. In only a very few of this Order do hooked bristles occur, and when present they make a part of the ventral branch of all the feet; while in the Tubicolæ this uniformity of structure is not observable,—nor in the Tubicolæ is their presence coincident with the existence of cirri.

The soft appendages of the *Annelides rapacia* are, in general, numerous and well developed. The cirri are the most constantly present, disappearing indeed only in a small number of genera placed upon the limits of the Order; but among the Tubicolæ the Hermellæ alone have them. Their usual form is that of a filament tapered gently to a point, and more or less contractile; but in some species the cirri are compressed and expanded into leaflets or miniature fins. With few exceptions there are two cirri to each foot (No. VIII. figs. 3, 4, 5).

The appendages which have received the name of Branchiæ are often absent. In some genera they appear under the guise of mere tubercles or fleshy papillæ, attached either at the summit or near the base of the foot; in others they are pectinated filaments; and in others much-divided arbuscular tufts of a crimson colour. The scales, which cover the back like a series of tiles, are peculiar to a few genera of this Order.

These soft appendages are repeated in nearly unvaried uniformity along each side of the body, so that every segment is the same in its gear; but in some species the superior cirri, the scales, or the branchial tubercles, appear and disappear alternately from ring to ring.

It is very common to find the first segment provided only with tentacular cirri, destitute alike of setigerous tubercles and proper branchiæ; and towards both extremities of the body its appendages are either obsolete or less developed than they are near the middle. The anal segment has its appendages commonly reduced to a pair of terminal styles, which originate from each side of its aperture (fig. 6).

Such are the most remarkable features in the external anatomy of these annelidans; but the bristles form so marked a character in them, and influence their habits so much, that it seems necessary to enter at length into a description of their peculiarities,—the more especially as they constitute the principal means of defence against the enemies that surround them. Some annelidans, when alarmed, such as the Aphrodites, instinctively contract the body into a sort of ball, bringing the head and tail into near contact; and in this manner seem anxious to elude the danger. Others, that have a long vermiform body, wriggle and twist themselves with violence, as if they would frighten away the foe by their contortions; but these are weak resources in comparison with the protection they derive from their panoply of spines and bristles. And it is curious to remark that as these diminish in size and piquancy, and become better adapted to locomotion than offence, the worms, as if conscious of their defenceless state, forsake the nomade life, and seek additional security by digging themselves furrows for retreat in the sand and mud.

Savigny was, perhaps, the first to notice that the bristles* are generally capable of being retracted within the body of the worm, and of being again protruded at pleasure by means of appropriate muscles; but he does not appear to have studied these organs in relation to their office of defence, nor has he given any figures sufficiently magnified to show how aptly they are fitted for this purpose. It was left to Audouin and Milne-Edwards to fill up this blank in the history of the Annelides, and we proceed to give their analysis of these organs.

The Bristles are distinguished into spines (aciculi), and bristles properly so called (festucæ).

The Spine is of one kind only (No. XII. fig. 11). It is distinguished from the bristles by its central position and its larger size. It is straight, conical, pointed, of a brown or blackish colour, and always a shade darker than that of the bristles with which it is associated. It is very rare to find more than one in each branch of the foot, and there are never more than two. Sometimes none can be discovered. The worm, say our authors, employs this weapon to give the "coup de grace" to the enemy against which it is directed,—the comparative shortness and stoutness permitting it to be used with a force and precision which it is impossible to impart to the weak and flexible bristles; and the comparatively blunt point making a wide wound. Each spine is composed of the shaft (*a*),

No. XII.

* See Oersted's definition of the Bristles in his 'Annul. Dan. Consp.' p. 5, and copy.

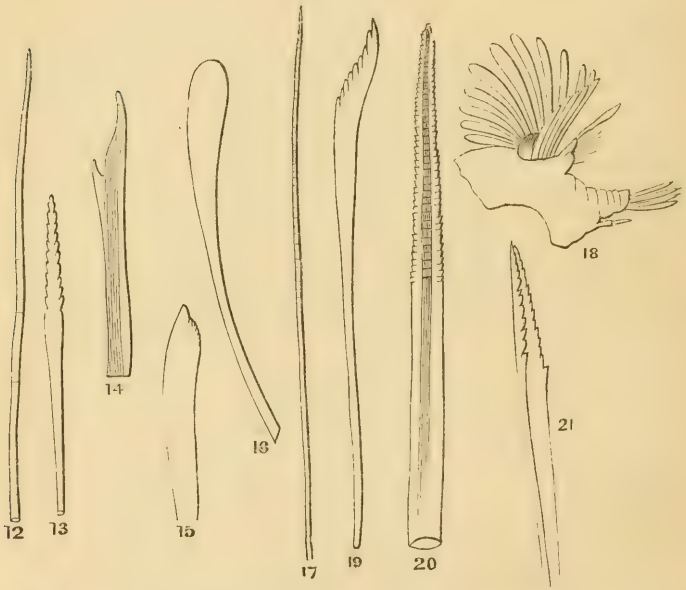
and of the base or cupule (*b*). When the spine is forcibly torn away from its sheath, the cupule is detached, and remains adherent to the fascicle of muscular fibres in which it is implanted.

The Bristles are much varied. They may be divided in the first place into the simple and compound*.

The simple bristles (No. XIII. fig. 12–21) are formed of a single piece only; or if any are composed of several pieces, these are all of the same kind, and superadded to one another like the articulations of the filiform or setaceous antennæ of certain insects, or rather like the joints of a Conferva (fig. 12).

The form of the simple bristle is very variable. Some terminate in a more or less sharp point, either cutting, denticulated, or forked (figs. 13, 14); others are obtuse and rounded, or even enlarged at the extremity (figs. 15, 16). Some are of such extreme fineness, that they may more properly be called hairs than bristles (fig. 17).

No. XIII.



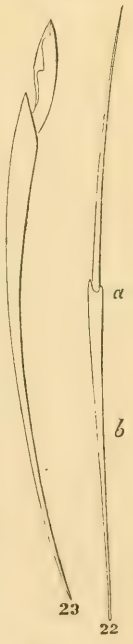
Such are the beautifully coloured metallic and iridescent hairs which garnish the sides and feet of the Aphrodites; and in some species of this genus a portion of these long hairs is interlaced so as to form a sort of felted membrane to cover the scales and branchiæ, and protect them from injury. But the utility of such hairs, in other respects, is of a passive kind:—they may make the worm troublesome to the palate of a foe, but they cannot be directed against that

* The figures of Oersted in pl. 1 of his 'Annul. Dan. Consp.' are excellent.

foe as weapons of defence, for which their slenderness and flexibility would render them of no avail. But we likewise find in the Aphrodites, and in several other genera, certain smooth tapered bristles which are less numerous, not so flexible, nor so long,—sometimes even short and stiff. These can be retracted within their own sheaths entirely or in part; and they may be used, like so many needles, against any soft creature that offers umbrage or war.

The simple bristles of some Annelides are clavate (fig. 16), of which certain species of *Lombrinera* furnish examples. In the Palmyres there are bristles compressed upwards, and in some degree spathulate (fig. 18). The dorsal branch of the foot of certain Nereides, and more especially the ventral branch of that of *Aphrodita aculeata*, is furnished with bristles terminating in a sort of forceps, or a fork with unequal prongs (fig. 4), either smooth or serrated on the margins. In other Annelides, the bristles are channeled towards their points (fig. 21), the sides of the groove being serrulated for a greater or less extent. We find bristles of this kind in the Polynoës, which have the figure of a grooved probe; others which are pointed like a lancet; and in *Polynoë scolopendrina*, this lancet-like point is bifurcated (fig. 15). There are other forms of simple bristles which will be illustrated in the descriptions of the species,—bristles imitative of stilettos, pikes, scimitars, and saws,—and indeed so various, that Man wonders, while he confesses the fertility of Nature in her delicate inventions.

No. XIV.



The compound bristles are distinguished by being composed of two pieces, the point distinctly *articulated* to the shaft*. The shaft is the lower portion (No. XIV. fig. 22 *b*), which is always imbedded in the substance of the foot; and it is on the end of this portion that the joint is hollowed for the reception of the external portion or point (fig. 22 *a*).

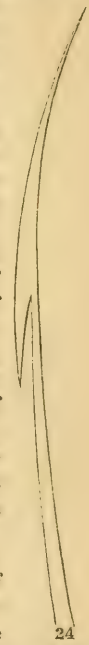
From the fineness of some of the compound bristles, more especially of their points, it must be evident that they cannot prove formidable weapons, for a slight resistance will bend the outer portion, and thrust aside the apex. There are, however, others which are stronger and more rigid, and can be made undoubtedly offensive. These are usually a part of the armature of the ventral branch of the foot. The shaft here supports a short point fashioned like a hedge-bill or chopping-knife (fig. 23); and it is probable that when the worm has thrust this weapon into the enemy, or its prey, it is loosened from its connexion with the shaft, and left to fester in the wound. That this is the case with these, and some other bristles of analogous conformation, we may conclude the more

* Not articulated, but welded to. See Williams, Rep. Brit. Assoc. p. 210.

certainly because of their exact resemblance, in miniature, to the different forms which the ingenuity of man has given to his instruments of warfare to render them more hurtful and deadly; and man possesses none which are better adapted to their purpose than the bristles with which certain Annelides are furnished. In fact, we can find no fitter instruments wherewith to compare the annelidan armoury, than harpoons, bayonets, lances, spears, and bill-hooks*.

The harpoon-bristle offers this peculiarity,—it is not always complete, and it appears to be produced sometimes only when required†. If we figure to ourselves a very acutely pointed bristle marked obliquely by a cross line beneath, indicating the place of junction between the point and the shaft, we shall have a pretty exact idea of the reality (No. XV. fig. 24). The use of this novel weapon seems to be sufficiently indicated by its shape. It is evident that if the bristle is thrust deep enough into an opposing body so that the harpoon is wholly immersed, this cannot be again withdrawn on account of the hold taken by the reverted tooth. And as this connexion might prove inconvenient, if not dangerous, to the worm, when the enemy was equal in bulk, or more powerful than itself, it has the power of detaching the harpoon from the shaft, and keeping itself thus at freedom to act, and to renew the battle. Audouin and M.-Edwards have noticed several individuals that, from being apparently engaged in repeated combats, had lost all these weapons Yet, though they were thus deprived of an essential part, the bristles were still formidable enough; for as the harpoon breaks off at the joint in an oblique manner, the shaft is left with an acute sloped apex, against which no soft creature could press without danger of a severe wound.

No. XV.



24

The structure of the bayonet-bristles (No. XVI. fig. 25–27) is more complicated. These are armed with a kind of pricker which is joined on to the extremity and side of the shaft in much the same way as a bayonet is fixed to the end of a musket (fig. 25). This appendage is not only very sharp, and formed with several cutting surfaces, but it is incised below into a spine pointed backwards (*a*), which gives it the advantage and property of a harpoon. Hence, having been forced to penetrate the flesh, the point cannot be again extricated, but is detached at once from the side of the shaft on which it was articulated. This, however, is not the most curious part of the instrument; and were it

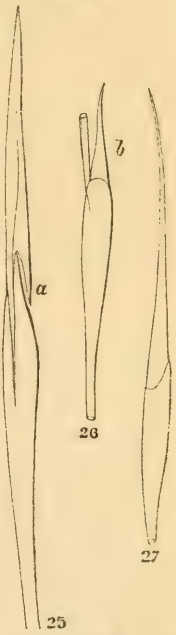
* The Bristles: fixed resemblances "to implements of ordinary use," but so small in size, and so delicate in tooling, that they are made rather for the admiration of man than for the use of the worm that bears, &c.

The Satan of the ancient "Mysteries" was "a werm with an aungelys face."

† "Ils offrent cela de remarquable, que le harpon ne se montre pas toujours tout formé, et qu'il paraît quelquefois ne se produire que lorsque le besoin l'exige." —*Ann. des Sc. Nat.* xxvii. p. 378.

desirable to have any addition to man's weapons fit for war, it might furnish the model of a new kind as formidable as any we yet possess. The bayonet part of the bristle is, in fact, also a sheath, which encloses another weapon that is only exposed when the scabbard has been lost. When we separate the bayonet from the shaft, we, at the same time, force from its interior a horny stylette (fig. 26 *b*),—the true termination of the bristle,—so that the place where the bayonet is attached is not obtuse or inflated, as it seems to be, but is, on the contrary, tipped with a needle-like point, ready to become a good defensive instrument when the enclosing appendage has been lost or expended.

No. XVI.



The *Aphrodita hystrix* has, in the dorsal branch of its feet, bristles of a very different composition, and which may be described as lances*. It is easy enough to form a notion of their form by recalling to ourselves the figure of a lance, or of a long pike barbed on the edges near the apex (No. XVII. fig. 28); and let it be remembered that the lances of the Annelid are so small that a considerable magnifier is required to discover their workmanship, which excels in finish the finest instrument manufactured by the skill and patience of the most expert artificer; for, unlike man's productions, this tiny lance "not only bears the microscopic glance, but the more minutely it is examined, the more fully its exquisite organization is disclosed†." A great number of these bristles garnish the extremity of each foot, and as they are stiff and serried, they form a hedge of spears round the body of the worm, placing it, as it were, within a square of pointed pikes threatening at all points‡.

Associated with the lance-bristles, there are found, in the same Aphrodite, numerous others terminating in a sort of knob (fig. 29). When this knob is opened longitudinally, there is found within it a barbed lance, in all respects resembling those just described (fig. 30). So the lance-bristles appear to be bristles which have been deprived of their sheaths. The sheath secures only the barbed point, and each barbule has its own little separate sheath or furrow, as may be seen on separating the valves of the main sheath. Then, on inspection of the inner side of either valve, it is not difficult to discover

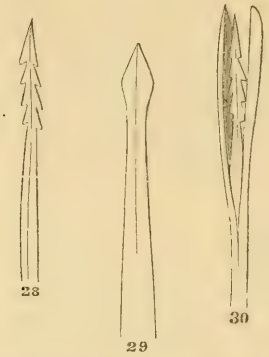
* "Flèches" is the term used by Audouin and Milne-Edwards; but as the weapon is thrust, and not shot, I have preferred lances to arrows.

† See the Chapter LI.—"Art and Nature compared,"—in 'Baker's Microscope made easy,' p. 292, 3rd edit. Lond. 1744.

‡ In reference to *Aphrodita hystrix*, Mr. Alder writes me: "They are very inconvenient neighbours in a bottle, as their sharp spines stick into everything; and in examining the contents of a dredge where they are, they pierce the fingers, breaking in and becoming very painful."—*Letter*, Feb. 17, 1854.

the little gutters in which the barbules are laid, and which are accurately adapted for their reception. The end of this singularly beautiful and complicated apparatus is obvious enough. Like the bristles of the Annelidans in general, the lance-bristle is retractile; but as the barbules are pointed backwards, it could not have been drawn

No. XVII.



within the soft body without a painful laceration of the parts. To obviate this, a sheath has been provided to enclose the whole; and thus covered, the bristle moves with an easy play. Nor is it difficult to explain how, when the barbed point is needed by the necessities of the worm, the sheath is put aside. This consists of two pieces or valves accurately adapted to each other, leaving a small fissure or gape where they meet above, and through which the apex of the lance is occasionally seen protruded. The sheath is also flexible and elastic, and its valves, which are naturally in close opposition, are capable of easy separation. Thus, when an enemy or prey comes in contact with the apex of the lance, this is thrust through the gape of the valves onwards to penetrate the opposing object; and by the protrusion, the sheath, having lost the support it had from the lance, is not only separated into its valves, but these are bent and folded backwards. They return again to their natural position and closure as the lance is withdrawn, and this is effected by their inherent elasticity*.

Other forms of Bristles will be described as they occur to us in our examination of the species. In the meantime, as we are dealing in marvels, let me ask the naturalist to count the number which may be required to furnish the garniture of a single individual. There are Annelides which have 500 feet on each side,—each foot has two branches,—and each branch has at least one spine and one brush of

* "In human works, though labour'd on with pain,
A thousand movements scarce one purpose gain:
In God's, one single can its end produce;
Yet serves to second too some other use."
POPE, *Essay on Man*, Epist. i. l. 53.

bristles, some of them simple, some of them compound. This individual then has 2000 spines at least; and if we reckon ten bristles to each brush, it has also 20,000 of them! This, as Sir Thomas Brown would say, is one of the "magnalities" of nature; yet, let us look a little further—not merely to the exquisite finish of each bristle, but to the means by which the host is put in motion. There is a set of muscles to push them forth from their port-holes,—there is another to replace each and all of them within their proper cases; and the uncounted crowd of these muscles neither twist nor knot together, but play in their courses regulated by a will that controls them more effectually than any brace;—that now spurs them to convulsive energy,—now stills them to rest,—and anon puts them into action where the ease and grace charm us to admiration, and fix the belief that even these creeping things participate largely in the happiness diffused throughout creation!

> "Man liveth only in himself, but the Lord liveth in all things;
> And His pervading unity quickeneth the whole creation.
> Man doeth one thing at once, nor can he think two thoughts together;
> But God compasseth all things, mantling the globe like air:
> And we render homage to His wisdom, seeing use in all His creatures,
> For, perchance, the universe would die, were not all things as they are."
>
> TUPPER, *Prov. Philosophy.*

SYNOPSIS OF THE FAMILIES OF ANNELIDES RAPACIA.

A. *Rings of the body dissimilar, in so far that on some certain numbers of them the scales or superior cirri alternately appear and disappear.*

Family I. **APHRODITACEÆ.** Back usually covered with scales: branchiæ rudimentary: head distinct: proboscis with two pairs of jaws.

B. *Rings of the body similar: no scales.*

* *Head distinct: no jaws: branchiæ developed in arbuscles, tufts or crests attached to the back or base of the feet: no spines.*

Family II. **AMPHINOMÆ.**

** *Head distinct, rarely without antennæ and eyes: jaws usually present: branchiæ either obsolete, or in the form of a filament inserted in a single straight or spiral series, or in the form of lobules or tonguelets: spines rarely absent.*

† *Proboscis with from seven to nine jaws articulated together: branchiæ either obsolete, or well-developed in the form of pectinated filaments inserted above the dorsal cirrus: feet with spines.*

Family III. **EUNICÆ.**

†† *Proboscis very large, with one or two pairs of jaws, rarely wanting: branchiæ either obsolete or lobular, inserted generally on the apex of the feet: tentacular cirri and spines generally distinct.*

Family IV. **NEREIDÆ.** Branchiæ obsolete, combined with the lobes of the feet.

Family V. **NEPHTHYACEÆ.** Branchiæ in the form of a sickle-shaped process between the foliaceous lobes of the feet: proboscis ciliated on the transverse cleft aperture.

Family VI. **PHYLLODOCIDÆ.** Branchiæ a heart-shaped leaf forming the dorsal branch of the foot: proboscis encircled with papillæ.

Family VII. **GLYCERACEÆ.** Branchiæ, when present, in the form of a cirrus, on the dorsal branch of the two separate or connate branches of the feet: head with four tentacula.

Family VIII. **SYLLIDÆ.** Head small, lobed in front, and tentaculated: proboscis cylindrical, without jaws: feet uniramous, with two or only one cirrus: tentacular filaments elongate.

*** *Head confluent, indistinct: antennæ none, or rudimentary: proboscis very short or none, without jaws.*

Family IX. **AMYTIACEÆ.** Tentacles two or four, moderate-sized: proboscis none: feet uniramous or biramous: no branchiæ.

Family X. **ARICIADÆ.** Tentacles two, elongate, or none: proboscis short, or none, without jaws or tentacles: feet short, biramous, with or without cirri: the branchiæ attached to their base, filiform and cirriform.

Fam. I. APHRODITACEÆ.

Aphrodita, *Linn. Syst.* x. 655; xii. 1084.
Aphroditæ, *Pallas, Misc. Zool.* 75. *Lam. An. s. Vert.* v. 304.
Les Aphrodites, *Cuv. Règn. Anim.* iii. 206.
Aphroditæ, *Savigny, Syst. Annel.* 11 & 15.
Aphroditea, *Blainville in Dict. des Sc. nat.* lvii. 454; *Grube, Fam. Annel.* 34.
Aphroditæa, *Latreille, Fam. nat.* 239.
Aphrodisiens, *Aud. & M.-Edw. Litt. de la France*, ii. 58.
Aphroditaceæ, *Johnston in Ann. Nat. Hist.* ii. 424. *Williams in Rep. Brit. Assoc.* 1851, 200 & 237; *Ann. & Mag. Nat. Hist.* ser. 2. xii. 405. *Oersted, Annul Dan. Consp.* 9; *Annul. Dorsibranch.* 11.

Char. Body oval, oblong, or linear-elongate, depressed, of a definite number of segments, the back covered with scales in two rows: head distinct, antenniferous, with eyes on the vertex in one or two pairs: proboscis cylindrical, fringed with papillæ round the orifice, and armed with four jaws in adjunct pairs: feet well developed, not uniform in structure, for some are furnished with a superior cirrus and usually with branchiæ, but have no scales; while others, usually squamous, are neither branchial nor cirriferous; and these different kinds of feet alternate, for a definite space, along the sides: branchiæ sometimes obsolete, always rudimentary and concealed, in the form of crests or tubercles situated on the upper part of the dorsal branch of the foot above the cirrus. Bristles stout, simple or compound, each fascicle with a spine.

*Obs.** Of the Annelides furnished with a distinct head, there are some which are flattish and of an oval form; others are slender, cylindraceous and almost filiform. The former constitute the genus *Aphrodita* of Linnæus, the latter his *Nereis*, but these genera embrace animals too dissimilar to be so closely associated. Bruguière, who saw this, began the reform and led the way to a more natural classification: he divided the *Aphroditæ* into two groups, to one of which he preserved the Linnæan name, and he called the other *Amphinome*. For the time, this was considered a sufficient subdivision; and Bruguière was followed implicitly, in the first instance by Cuvier and Lamarck; but when Savigny, with richer materials and a deeper knowledge of them, had raised the *Aphroditæ* to the rank of a family with its several subordinate genera, his arrangement and nomenclature were readily adopted by Lamarck, Latreille, and Blainville, and, we may add, are now undisputed.

The *Aphroditaceæ* possess all the characters of the order to which they belong: the head is distinct, they have eyes, antennæ, a fleshy

* Translated, but not literally, from Audouin and Milne-Edwards.

retractile proboscis, and feet to every ring of the body, armed with spines (*aciculi*), bristles (*festucæ*) more or less retractile, and with soft appendages highly developed, but in no instance with the crotchets (*uncinuli*) which belong to less typical orders. In form, the *Aphroditaceæ* are in general very unlike the majority of Annelides, for the body in most of them is short, flattened, and more or less inclined to oval, although there are among them some which are slender, elongated, and nearly as cylindrical as the *Nereides*. But there is nothing more remarkable in the external structure of the generality of the *Aphroditaceæ* than the large membranous scales or *elytra*, as Savigny calls them, which lie along the back in a double series, and cover it like a coat of mail. These organs are affixed to the base of the superior branch of the feet by means of a short pedicle, and are formed of two cutaneous or epidermoid layers applied the one against the other, but capable of being separated so as to become vesicular, and at certain seasons of the year they appear to be filled with ova. There are, however, in all *Aphroditaceæ*, a certain number of feet which carry no scales or elytra, and which alternate with those that are provided with them. The first, the third, and the sixth pairs are almost constantly defective in this respect, and of the feet which follow, the alternate pairs for a more or less considerable extent of the body; but after the twenty-third, the twenty-fifth, or the twenty-seventh segment, this regular alternation ceases, for posterior to one or other of these segments, the feet may be either all squamous or all entirely naked, or the elytra may continue to appear and disappear alternately, but in an altered series; for it is now not every other, but every third foot which bears an elytron. Instances, however, occur in which the binary alternation of squamous and naked feet prevails throughout the whole length of the body, as in the genus *Acöete*; and in the *Palmyra* of Savigny there are no elytra at all.

In some of the *Nereides* (*Phyllodoce*) we find on each side of the body a series of foliaceous lamellæ, which resemble the scales of the *Aphroditaceæ*, but these are really very different organs, and never disposed in the alternating manner of the latter, the feet of *Phyllodoce* being all alike. No other Annelide offers any similar structure; so that the presence of feet garnished with scales which alternate with other feet destitute of that appendage, is unquestionably one of the most important characters of the present family, and its leading peculiarity.

The elytra are very variable in number, and their shape is not always alike. From their structure it appears probable that they are subservient to respiration, yet we see them often associated with organs to which the name of branchiæ has been given. These are concealed below the elytra, and have the form of small crests or cutaneous nipples; they occupy the upper part of the base of the feet, and are always placed within and above the cirrus of the dorsal branch. Sometimes these little appendages are scarcely visible, and they are very rarely to be detected on the squamigerous feet,—that is, on the feet of the second, the fourth, the fifth, the seventh, the

ninth segments, and so on. This binary alternation of branchial with abranchial feet is to be observed even in the species which have no elytra (*Palmyra*); but it is not so constant as has hitherto been believed, for in the genus *Acöete* branchial tubercles exist on all the feet, their number being only fewer on the segments which carry the elytra.

In the families allied to *Aphroditaceæ*, there are species which present no visible branchiæ; but when these organs exist, their form or their position is essentially different. Thus in the *Nereides* they affect the form of little fleshy, tongue-like processes, placed at the end of the foot between the superior and inferior cirrus; and although in the *Eunicеaceæ* and the *Amphinomenaceæ* they have nearly the same position as in the *Aphroditaceæ*, their configuration is very dissimilar, being in the form of filaments more or less pectinated, of tufts, of arbuscles, or of pinnatifid leaflets.

In the majority of *Aphroditaceæ* the presence of elytra coincides with the absence of superior cirri, that is, we find the latter only on such feet as carry branchiæ and do not bear scales. But this character, like the preceding, is liable to exception, for in *Sigalion* there is a superior cirrus to every segment of the body, whether elytrous or not; and this fact appears to invalidate the opinion of those who maintain, with Blainville, that the cirri are the analogues of the elytra, or modifications of the same organs, in those Annelides which are not shielded with dorsal scales,—an opinion which, from the dissimilarity of their position on the body, we might otherwise have hesitated to adopt. The feet of the *Aphroditaceæ* are divided into two branches, each furnished with a spine, with bristles, and with cirri, whose figures vary according to the species. We have spoken above of the superior cirri: the inferior are found on all the feet, and offer nothing remarkable for notice, unless on the first segment, where they are very large, and, with the superior, constitute tentacular cirri, a sort of antennæform filaments placed at each side of the head. But the true antennæ, however similar in appearance, are readily distinguished from them by their insertion on the head itself: of these we generally reckon three*, a middle one and one on each side; and under and exterior to them there are two larger setaceous filaments, which may without impropriety be denominated *palpi*, since they are used to feel the way during the creature's progress. The eyes are black points on the upper surface of the head, usually four in number, sometimes only two, and in *Sigalion* their existence is doubtful. From the mouth a proboscis is at pleasure evolved, which is armed with four jaws united in pairs, two above and two below, opposed the one to the other by their cutting edge; and this disposition is one of the peculiarities of the family, for in

* Savigny and Audouin and Milne-Edwards say five; but if we limit, as I think we ought, the term *antennæ* to those filaments which are strictly cranial, there are only three; and what these celebrated naturalists call *external antennæ*, I have, in the following descriptions, called *palpi*, since they originate under the head, and are obviously different in structure, as they appear to be also in their functions. See also Oersted, Consp. 5.

the *Euniceaceæ* there are never less than seven jaws, and in the *Amphinomenaceæ* there are none. Such also is the case with many of the *Nereides*, although several genera in this family have two jaws, and a few even four; but the pairs, unlike those of *Aphroditaceæ*, are perfectly distinct and widely separate.

Synopsis of Genera.

1. **Aphrodita.** Body oval or elliptical: the scales and superior cirri not coexistent on the same foot, but alternating: proboscis with rudimentary and cartilaginous jaws or none: antenna one only: palpi two, large: eyes two.
2. **Lepidonotus.** Body linear-oblong: the scales exposed and alternating with the superior cirri: proboscis with corneous jaws: antennæ three, unequal: palpi two, large: eyes four.
3. **Polynoë.** Body linear-elongate, vermiform: rest like *Lepidonotus*.
4. **Pholoë.** Body oblong: the scales placed over every alternate foot: cirri none or rudimentary: proboscis with four corneous jaws, the orifice plain: antennæ five, unequal, distinct: palpi two, large: eyes two.
5. **Sigalion.** Body linear-elongate: the scales and superior cirri coexistent on the same feet, the former placed over every alternate foot until the 27th segment, whence they follow uninterruptedly to the end of the body: proboscis with corneous jaws: antennæ rudimentary: palpi large: eyes none*.

1. APHRODITA†.

Halithea, *Savigny, Syst. Annel.* 11 & 18. *Lam. An. s. Vert.* v. 306.
Aphrodita, *Leach in Suppl. Encyclop. Brit.* i. 452. *Aud. & M.-Edw. Litt. de la France*, ii. 63. *Blainville in Dict. des Sc. nat.* lvii. 455. *Fleming in Encyclop. Brit.* edit. 7, xi. 221. *Johnston in Ann. Nat. Hist.* ii. 427.

Char. Body ovate or oblong, the back convex, covered with fifteen

* Oersted's synopsis of the family is as follows:—

	Genera.
1. Branchiæ alternating with the cirri.	
a. The back with a tomentose covering	Aphrodita.
b. The back without such covering.	
α. Scales 12–15 pairs, entirely covering the back.	Lepidonotus.
β. Scales 15–40 pairs, leaving the greater portion of the back uncovered	Polynoë.
2. Branchiæ not alternating with the cirri. (Scales to all the rings; no superior cirri.)	Pholoë.

† Aphrodite—the Greek name of Venus. In its application to a sea-worm, there may be some allusion to the supposed derivation from *ἀφρὸς*, 'foam of the sea.' Hesiod calls Venus *ἀφρογένεια*, 'foam-sprung.'

pairs of scales either concealed by a felt or exposed; the venter distinctly separate, flat, marked with the dissepiments and a longitudinal mesial furrow: head small, concealed, with one pair of eyes: proboscis encircled with compound tentacles; the jaws small, and sometimes obsolete: antenna one, mesial, small; the palpi two and long: segments 39, with scales on the 2nd, 4th, 5th, 7th, and every alternate segment to the 25th, and on the 28th and 32nd; the intervening segments with a dorsal cirrus: feet stout, biramous, with three fascicles of bristles, two on the dorsal and one on the ventral branch; and each foot has a ventral setaceous cirrus: bristles various, simple or compound, with a spine in each fascicle. No anal styles.

The *Aphroditæ* are oval in shape, and the rings of the body do not exceed thirty-nine. The head, more or less concealed by the scales or by the bristles, has two somewhat elevated eyes, and a small solitary subulate antenna; but the palpi are comparatively large. The orifice of the proboscis is encircled with penicillate tentacula, and armed, in general, with thin cartilaginous jaws. The feet are distinctly biramous, and garnished with three bundles of bristles, two of which belong to the dorsal, and the third to the ventral branch. The first pair of feet are small, and furnished with long tentacular cirri; but the posterior do not differ notably from the rest. The bristles of the dorsal branch are sometimes very complicated; those of the ventral simple or forked. The cirri are subulate, —the inferior small, the superior long. The scales are large, either naked to view, or concealed by a coarse felt formed by the bristles of the dorsal branch of the feet. There are fifteen pairs, and the 13th are always attached to the feet of the 25th segment,—the pairs which precede this* alternate on every other ring with the superior cirri, and the pairs which succeed it are placed on every third ring. The branchiæ consist of tubercles sometimes indistinct, often broken on their edges, disposed in transverse rows; and, like the dorsal cirri, they cease to appear and disappear alternately posterior to the 25th pair of feet. They sometimes differ very little from the protuberances which afford attachment to the scales.

* Scales concealed.

1. **Aph. aculeata**, hair-like bristles of the dorsal branch of the foot green and golden, forming a splendent fringe round the sides; the spine-like bristles dark brown. Length 3–4″. Plate IX.

Physalus, *Mouff. Theatr. Insect.* fig. in tab. ad finem. *Jonst. de Insect.* lib. iv. tab. 28.

Eruca marina Rondeletii pilis in dorso instar colli Columbinii variegatis, *Sibb. Scot. illustr.* pars sec. lib. iii. 32.

Scolopendra marina, *Molyneux in Phil. Trans. Abridg.* iv. 133, and 368, pl. 3. f. 6, 7. *Aldrov. Insect.* 636. f. 1.

* The 4th and 5th rings are, however, both squamiferous.

Eruca sive Scolopendra marina, *Seba, Thesaur.* i. 141. tab. 90. f. 1–3; iii. 9. tab. 4. f. 7, 8.

Vermis aureus, *Oligerus Jacobæus in Acta Hafniæ*, iii. 8 & 88, cum fig.

Mus marinus, *Linn. Syst.* edit. 1756, 79.

Aphrodita nitens, *Linn. Faun. Suec.* 367. no. 1284; *Mus. Adolph. Fred.* 93.

Aphrodita elliptica versicolor, and the Sea-Mouse, *Hill, Hist. Anim.* iii. 90, but not the fig. on pl. 5.

Aphrodita subrotunda, *Hill in lib. cit.* 91.

Aphrodita aculeata, *Linn. Syst.* x. 655; xii. 1084; *Faun. Suec.* 2nd edit. 509. *Pallas, Misc. Zool.* 77. tab. 7. f. 1–13. *Bast. Opusc. Subs.* ii. 62. pl. 6. f. 1–4. *Penn. Brit. Zool.* iv. 44. pl. 23. f. 25, and edit. 1812, iv. 86. tab. 25. f. 1. *Müll. Zool. Dan. Prod.* 218. no. 2641. *Turt. Gmel.* iv. 79; *Brit. Faun.* 136. *Stew. Elem.* i. 387. *Home, Comp. Anat.* pl. 39. f. 1, 2. *Blumenb. Elem. Nat. Hist.* 245. *Jameson in Wern. Mem.* i. 557. *Bosc, Vers*, i. 181. *Cuv. Règn. Anim.* iii. 206. *Aud. & M.-Edw. in Ann. des Sc. nat.* xxvii. 402. pl. 8. f. 7; *Hist. nat. Litt. de la France*, ii. 66. pl. 1 A. f. 7. *Edin. Journ. Nat. & Geogr. Sc.* iii. 51. *Roget, Bridgew. Treat.* ii. 102 & 298. *Johnston in Ann. Nat. Hist.* ii. 429. pl. 21, and v. 305. *Templeton in Loud. Mag. Nat. Hist.* ix. 234. *Blainv. Dict. des Sc. nat.* lvii. 456, *Atlas*, pl. fig. 1. *Fleming in Encyclop. Brit.* edit. 7. xi. 221. *Guérin, Icon. des Règn. Anim.* pl. 9. f. 1. *Williams, Rep. Brit. Assoc.* 1851, 172, 217, 237, and in *Ann. & Mag. Nat. Hist.* ser. 2. xii. 348. pl. 13. f. 5. *Dalyell, Pow. Creat.* ii. 170. pl. 24. f. 15, 16. *Oersted, Consp. Annul. Dan.* 11. *Grube, Fam. Annel.* 35.

Aphrodite hérissée, *Brug. Encyclop. Méth.* vi. 85.

Halithea aculeata, *Savigny, Syst. Annel.* 19. *Lam. Anim. s. Vert.* v. 307, and 2nd edit. v. 542. *Risso, l'Europ. Mérid.* iv. 412. *Stark, Elem.* ii. 140. *Edin. Journ. Nat. & Geogr. Sc.* iii. 246.

The Sea Scolopendra, *Adams, Paul. Ægin.* ii. 174; iii. 344.

The Sea Mouse, *Prov.*

Hab. The coralline region, common on the British coasts.

Desc. Body from 3 to 5 or even 8 inches long, oval, narrowest behind, convex dorsally, the back of an earthy colour, roughish, with a thick close felt of hair and membrane, forming a sort of skin which entirely conceals the scales; the sides clothed with long silky green and golden hairs clustered in fascicles, and glistening like burnished metal, with blackish-brown spiniform bristles intermixed: ventral surface flat, often light-coloured and dotted, sometimes dark brown, obsoletely ribbed across. Head small, entirely concealed, roundish, with two round clear spots or eyes on the vertex: antenna minute: palpi large, subulate, flesh-coloured or dusky, jointed at the base, where they approximate, but are separated by a black membranous crest: mouth with a large edentulous proboscis; the orifice encircled with a short, even, thick-set fringe of compound penicillate filaments ivided into two sets by a fissure on each side; each filament has a short stalk with a tuft of numerous forked papillæ on its summit; exterior to the orifice of the proboscis there are four fleshy tubercles placed at the angles. Scales fifteen pairs, roundish, smooth, thin and vesicular, blotched with black stains and specks, the first pair

small, laid over the head, the anal pair oval. Feet thirty-nine pairs*, largest and most developed near the middle of the belly, very small and approximate at the anus, biramous, the branches wide asunder; the superior carries, in a sort of crest-like fashion, the long, flexible, brilliant coloured bristles which form the silky fringe on each side of the body, and above them some still more delicate hairs, which, by their intertexture, constitute the membrane covering the scales, and with which the strong spiniform bristles are intermixed, placed in a sort of cross series: the inferior branch is armed with three rows of stout short bristles; in the upper row only two or three which are longer and stouter than those of the next row in which there are five or six; and which again are stouter, but less numerous than those in the lowest row. Spine golden-yellow, conical, smooth: superior cirrus long, subulate, bulged at the base; the inferior short and conical. Anus large, with a dorsal aspect, encircled with several tentacular cirri.

The very vivid iridescent hues which the hairs of this remarkable worm reflect, render it an object of wonder and surprise to the most incurious: they are not equalled by the colours of the most gaudy butterfly, and rival the splendour of the diamond beetle†. It creeps at a slow pace, and in its progress a current of water is projected at short intervals, and with considerable force, from the anus. When placed in fresh water, the creature gives immediate signs of its painful situation, and soon dies, first ejecting a white milky fluid, and, in the agony of death, a large quantity of a blackish-green turbid liquor. The size and strength of the proboscis is remarkable, and not less so the structure of the filaments which garnish the orifice‡. The œsophagus is short; the stomach and intestine seem to be alike and inseparable;—together they form a straight intestine, sometimes with a wide dilatation in some part of its canal, with a velvety inner surface folded into longitudinal plaits near the termination at the anus. Although planted round with offensive arms of apparently considerable strength, the worm is said to be a favourite prey of the cod-fish, in whose stomach specimens, in a perfect condition, may be

* Pallas says, "constanter 40–41. Horum 2 primi minuti, compressi submutici, ex oris quasi palato antrorsum producti, villo barbati, at setis et cirrho destituti."

† "Eh aculeata Aphrodita!" (Linn. Mus. Fred. xv.) "The *Aphrodita aculeata* reflecting the sun-beams from the depths of the sea, exhibits as vivid colours as the peacock itself spreading its jewelled train." (Linnæus in Smith's 'Tracts relating to Natural History,' p. 32.) "L'or, l'azur, le pourpre, le vert, se nuancent à leur surface de mille manières, et ces couleurs, souvent irisées, se trouvent dans une harmonie parfaite avec les réflets chatoyans et successifs des anneaux de leur corps. L'aile du papillon n'a pas reçu une plus brillante parure que ces vers cachés au fond des eaux, et enfoncés quelquefois dans un limon noir et boueux." (Audouin and Milne-Edwards.) "Cuinam bono isthæc sint animantia me latet: serviunt tamen summis Dei miraculis demonstrandis, quæ loquitur, quidquid vel mare, vel terram incolit." (Seba, Thesaur. i. 142.)

‡ Pallas says that the Aphrodites, perhaps, receive their nourishment from fuci (Misc. Zool. p. 77). The structure of the proboscis seems unfavourable to this opinion; and as the habitat of Aphroditæ is the coralline region, animal food would be more within reach.

sometimes obtained. Baster tells us that the sexes are distinct: "Hæ Aphroditæ eodem, quo pisces, modo generare videntur; et si quis earum quasdam Junio mense dissecuirit, mares lactibus, fœmellas multis ovis instructas videbit."

(*a*) Firth of Forth, *Lieut. Thomas, R.N.*
(*b*) Berwick Bay, *Dr. Johnston.*
(*c*) Berwick Bay, *Dr. Johnston.*

PLATE IX. Fig. 1. *Aph. aculeata* of the natural size. 2. The head uncovered. 3. The head detached and somewhat magnified. 4. Under view of the anterior part of the body. 5. The orifice of the proboscis. 6. The proboscis laid open by a longitudinal section. 7. A few of the penicillate filaments magnified. 8 & 9. Two views of the feet. 10. Various bristles. 11. The spine.

2. **Aph. borealis**, proboscis edentulous; setaceous bristles of the dorsal branch of the foot without splendour, few; those of the ventral branch simple; all smooth. Length 14‴. Plate X. fig. 1–13.

Aphrodite borealis, *Johnston in Ann. Nat. Hist.* iv. 370. pl. 10. f. 1–13.

Hab. Coralline region: rare.

Desc. The specimen described is 14 lines in length, and 4 in its greatest breadth: the body is elliptical, rather narrower posteriorly than in front, of a uniform greyish-white colour, somewhat hairy and hispid on the sides from the various bristles which garnish the feet (Pl. X. figs. 1, 2). The scales form a series on each side; they are roundish, smooth, thin and flexible, vesicular in the specimen, probably from immersion in spirits; there are fifteen pairs of them, but the first two pairs and the three caudal ones are so small as to be easily overlooked. The head (fig. 3) is entirely concealed under the front scales; it is furnished with two proportionably large, setaceous, smooth palpi, approximated at the base, but I was not able to detect any antennæ. The mouth (fig. 4) is inferior, large, circular, puckered, armed with a strong retractile proboscis, the orifice of which is encircled with a row of tentacular papillæ (fig. 5), but there is no appearance of jaws. There seemed to be 30 feet on each side, but, from the closeness and minuteness of the posterior pairs, the number was not very exactly to be counted: they are biramous, the branches widely apart. The dorsal branch (fig. 6) of every alternate foot carries a scale or elytron, and is armed with spines, various bristles, and a sort of tangled hair, which partially covers the scale. It is shorter than the ventral branch, obtuse, somewhat sinuated, and contains two spines: the dorsal fascicle of bristles is long, reflected backwards, the bristles unequal in length, rather slender, sharp-pointed, smooth, and curved: the next fascicle consists of similar bristles, but shorter; and there is a still lower fascicle of very slender ones. The ventral branch (fig. 7) of the foot is strong, rugose, obtusely conoid, covered with minute transparent vesicles, and armed with five stout bristles, and with a spine of a yellowish

colour. The bristles are not extruded from the extremity, but from a sort of projection beneath it: the two upper ones are filiform, obtuse, and of a dark brown colour; the two next are most protruded, smooth, paler, with a sharp slightly curved point; and the under one is short and acutely pointed like a dagger. This branch then is armed with no less than four different sorts of bristles, calculated both to cut and lacerate and to pierce any opposing body; but besides all these, there is a soft filament (inferior cirrus, fig. 7 *a*) that originates from a bulb near the base, and is long enough to reach considerably beyond the extremity of the foot. This is evidently a feeler, with which the worm acquaints itself with the nature of the opposing body,—whether an enemy that it needs to repulse by the extrusion of its formidable weapons, or a feebler animal that it can overcome and make its prey. To assist its tactic powers, there are besides many tentacular filaments on each side, which originate from the dorsal branch of every alternate foot; these are smooth and subulate, and, except in their lesser size, resemble the palpi. The spines (fig. 8) are of a light yellow colour, tapering from a broad base to an obtuse point, smooth and transparent. The bristles (figs. 9–12) are brown, with a bronzed lustre, various in size and strength, but all of them quite smooth. The surface of the belly has a pearly hue, and the skin is thickly covered with minute vesicular granules (fig. 13), similar to those which are seen on certain parts of the foot. The use of these is probably to give the worm a firmer hold on the ground, and prevent any retrograde movement from the various evolutions of the feet. In examining this complicated structure, it is scarcely possible to refrain from some expression of surprise. "In figuris animantium (etiam minutarum) quam solers subtilisque descriptio partium, quamque admirabilis fabrica membrorum! Omnia, enim, quæ quidem intus inclusa sunt, ita nata atque ita locata sunt, ut nihil eorum supervacaneum sit, nihil ad vitam detinendam non necessarium*."

From the remarks of Audouin and Milne-Edwards, it appears that *Aphrodita hystrix* is subject to considerable variety in size, shape, and in the length of its feet†; and of course it would be frivolous to found any distinction of species on these particulars. But an inspection of their figure shows *Aph. hystrix* to be a more hispid worm than the one now described; and there are other characters which seem to me sufficient to prove them distinct.

Obs. I have seen only two specimens;—in one the scales were exposed to the naked eye, in the other they were hidden by an earthy-coloured felt. The species is evidently more nearly related to *Aph. aculeata* than to *Aph. hystrix*. I have compared specimens nearly of equal size, and the absence of the coloured bristles in *Aph. borealis* at once draws attention to it. It is besides much less hairy over the feet, and there are no brown spines inclined backwards and upwards on the back.

(*a*) Berwick Bay, *Dr. Johnston*.

* Cicero de Nat. Deor. lib. 2.

† Hist. Nat. du Litt. de la France, ii. 74.

PLATE X. Fig. 1. *Aph. borealis* of the natural size. 2. The same on the ventral aspect. 3. The anterior part magnified. 4. The same seen from below. 5. The proboscis laid open. 6. An outline of a foot. 7. The ventral branch of a foot more highly magnified. 8. Two spines. 9. Bristles of the superior fascicle. 10. A filiform bristle. 11. A bristle from the ventral branch. 12. Bristles from the inferior fascicle of the dorsal branch. 13. A portion of the skin of the belly magnified.

** Scales naked = Hermione, *Blainville.*

3. **Aph. hystrix,** proboscis with minute jaws; some bristles of the dorsal branch of the foot serrulate at their point; those of the ventral branch forked; inferior cirrus very short. Length 2″; breadth 7‴. Plate XI. fig. *a–e.*

Halithea hystrix, *Savig. Syst. Annel.* 20. *Lam. Anim. s. Vert.* v. ; 2de édit. v. 543. *Cuv. Règn. Anim.* iii. 207. *Risso, l'Europ. mérid.* iv. 413.

Hermione hystrix, *Blainv. Dict.* lvii. 457, but not the figure so named in the *Atlas.*

Aphrodita hystrix, *Aud. & M.-Edw. Litt. de la France,* ii. 70. pl. 1. f. 1–9. *Johnston in Ann. Nat. Hist.* iv. 370; v. 305. pl. 5. f. *a–e. Oersted, Annul. Dan. Consp.* 11. *Grube, Fam. Annel.* 36.

Aphrodita hispida, *Jones, Anim. Kingd.* 214. f. 88.

Hab. The British coast in from 20 to 30 fathoms.

Desc. Body elliptic-oblong, depressed, the back covered with 15 pairs of imbricated naked scales; the sides hirsute and spinous, with golden and brown-coloured bristles; the ventral surface of a dirty blackish-brown colour, covered with a coriaceous tuberculated skin, marked with transverse parallel rugæ along the margins, and with a narrow depressed space down the centre. Head small, entirely concealed under the front scales; eyes very distinct, occipital, pedunculate; between and above the peduncles there is a short porrect biarticulate antenna, and on one side of the mouth a long awl-shaped ciliated palpus invested with a fleshy sheath at the base. Proboscis large and muscular. Scales large, irregularly heart-shaped, smooth, soft, thin and membranous, with entire even margins, overlapping each other on the median line and behind; the anterior pair is small, rounder than the others, and hidden under those that follow; and the posterior pairs are likewise so much imbricated, that the anal ones are almost concealed: they are all attached to a fleshy peduncle, and are of a greyish or flesh-colour tinted with brown. Feet 32 pairs; the anterior and posterior are minute, but they gradually increase in size towards the middle of the body, where they attain their greatest development. They are of two kinds,—the squamiferous and cirrigerous,—but a foot of either is divisible into two branches, viz. a ventral and dorsal. The ventral branch (or proper foot) forms a stout, rough, tuberculated, conoid process, armed with a stout spine protruded from the pale papillary apex, and with four or five firm bristles proceeding from under the apex, and partially

surrounding the spine. The spine tapers insensibly to an obtuse point, is smooth, and of a pale yellow colour: the bristles are of a rich burnished brown colour, with a round shank which grows a little thicker upwards, and is terminated with a curved cutting point like a pruning-knife; in most of them there is also a tooth-like process on the inner side beneath this point (Pl. XI. fig. *a*). The cirrus of the foot does not reach its apex, excepting that of the first pairs; it is fleshy, setaceous, and of a pale colour. The dorsal branch of all the feet has an upward direction, and cannot be used as an organ of progression along the ground: that of the squamous feet is armed with two bundles of bristles (*b*), each proceeding from a distinct tubercle; the innermost or dorsad brush consists of many slender, golden-yellow bristles, arranged in a fan-shaped manner; they are comparatively short, curved like the italic letter *f*, and roughened with minute granulations on their upper half (*c*). The bristles of the other brush, placed between the dorsad one and the proper foot, are remarkable for their stoutness and length; they are of a rich dark brown colour, straight, and terminated with a lanceolate point, which is notched on each side with four reverted barbs, so that the bristle resembles the barbed arrow or spear of the South-Sea islanders (*d*). The notches are not opposite, but alternate, and they are enclosed within a plain sheath, consisting of two dilated valves which shut upon them (*e*). The cirrigerous foot has a single fan-shaped brush of bristles only; the bristles are simple and curved like those of the dorsad fascicles of the squamous feet, but they are more numerous, slenderer, longer, of a paler colour, and quite smooth; they are unequal in length, some of them very fine and hair-like, and the whole brush is usually matted and soiled with extraneous matters. Length of the worm 2 inches; breadth $\frac{6}{10}$ths.

(*a*) The English Channel, *Joshua Alder, Esq.*

Plate XI. Fig. *a*. Spine. *b*. Foot. *c*. Spine. *d* & *e*. Bristles.

2. LEPIDONOTUS.

Lepidonotus, *Leach in Ann. Phil.* xiv. 205 (1819), *and in Supp. Encyclop. Brit.* i. 452.
Lepidonote, *Oersted, Annul. Dan. Consp.* 12; *Annul. Dorsibr.* 11.
Polynoë*, *Savigny, Syst. Annel.* 20. *Lam. An. s. Vert.* v. 308. *Aud. & M.-Edw. Litt. de la France*, ii. 74. *Cuv. Règn. Anim.* iii. 207. *Johnston in Ann. Nat. Hist.* ii. 428 & 431. *Williams, Rep. Brit. Assoc.* 1851, 217.
Eumolphe, *Blainville in Dict. des Sc. nat.* lvii. 457.

Char. Body oblong, flattened, obtuse and rounded at both ends, composed of a definite number of segments, the back covered with two rows of scales: head distinct, with two pairs of eyes on the sinciput: proboscis fringed with simple tentacles at the orifice, and furnished with two jaws: antennæ 3; palpi 2; tentacula two on

* Polynoë—one of the Nereids. Risso writes the name Polinoë (l'Europ. Mérid. iv. 414).

each side; these are similar in structure, and jointed only at the base: scales naked, 12 placed over every alternate segment, so that the 12th is on the 23rd; if there are more scales, the succeeding are on every third segment: feet well-developed, biramous, but the branches are almost connate, furnished with two fascicles of bristles, the superior in a spreading tuft, the inferior in a flattish brush, a spine to each fascicle: bristles simple, stout, the superior tapered to a serrulate point; the inferior with a claw-like point, and flattened underneath on one side of the shaft, where it is roughened with spinous denticles in close-set transverse series: anal segment with styles.

Lepidonotus is readily distinguished from *Aphrodita* by the number of the antennæ, by the more powerful armature of the mouth, and by the part of the body at which the scales cease to alternate with the cirri. The form of the body, and the number of its component rings, vary much; all our known native species are linear or elliptic-oblong, but there are foreign species of a linear and worm-like figure. The back is either entirely covered with the scales, or naked in the middle, the scales in the latter being less developed and not meeting on the mesial line.

The head of the *Lepidonoti* is large and corneous, with four eyes on its upper convex surface arranged in pairs: the antennæ are rarely two only, three being the usual number, of which the central one is longer than the lateral, and it again yields in strength and longitude to the palpi. The mouth has a projectile proboscis, with a circle of little tentacula round its orifice, and four large horny jaws curved at their points. The scales or elytra are always exposed, and are very variable in number, but the first twelve pairs regularly alternate with the superior cirri on the first twenty-three segments, and if more elytra exist, they alternate in a different series, or on every third segment: they are lamellar or sometimes vesicular, and either smooth or covered with little granulations. The branchiæ, which are simple and obscure, exist only on the non-elytrous feet, and follow consequently the same alternating order. The feet are bifid, but the superior branch is small and almost confluent with the inferior, which is greatly developed. The superior cirri are long, the inferior short and conical: the bristles of the superior branch short, and almost always slenderer than those of the inferior, subulate and smooth at the point, or like the inferior bristles, somewhat thickened and serrulate along the edge. The spines present no peculiarity. The first pair of feet are destitute of bristles, but are terminated by two long tentacular cirri, which advance on each side of the head and resemble antennæ; while on the last segment we find filiform appendages formed by a nutation of the superior cirri, and constituting in general terminal styles.

The *Lepidonoti* are carnivorous. They prey on living invertebrates; and the strong do not hesitate to kill and eat the weaker of their own and allied species. They live in obscurity on rocky shores,

and can move with considerable quickness. Some of them swim easily in a wriggling manner, but they hasten to find the bottom. They have the power of renewing the scales, which are frequently removed by abrasion and injuries. It has been generally assumed that the number of pairs is constant in every species, and affords a most obvious discriminative character; but Sir John G. Dalyell doubts, or rather denies this; his observations on this genus are, however, very unsatisfactory, from not having distinguished the species with any care.

* Scales 12 pairs, fixed. Tardigrade.

1. **L. squamatus**, scales ovate and reniform, imbricate, granulous, ciliated on the outer margin; tentacula and tentacular cirri incrassated below the point; bristles of the ventral branch with sharp denticles on the thickened portion of the shaft below the smooth talon-like apex. Length 1–2″; breadth 3‴. Plate VII. fig. 1.

Aphrodita squamata, *Linn. Syst.* x. 655; xii. 1084. *Pallas, Misc. Zool.* 91. tab. 7. f. 14 *a–d.* *Bast. Opusc. Subs.* ii. 66. pl. 6. f. 5. *Penn. Brit. Zool.* iv. 44. pl. 23. f. 26, and edit. 1812, iv. tab. 25. f. 2. *Turt. Gmel.* iv. 80; *Brit. Faun.* 136. *Stew. Elem.* i. 387. *Dalyell, Pow. Creat.* ii. 166. pl. 24. f. 4–10.

Gedüpfelte Aphrodite, *Müll. Wurm-Arten*, 171. tab. 13, copied in *Encyclop. Méth. Vers*, pl. 61. f. 21–26.

Aphrodita scabra, *Penn. Brit. Zool.* iv. 88. *Turt. Gmel.* iv. 80; *Brit. Faun.* 136. *Stew. Elem.* i. 387. *Jameson in Wern. Mem.* i. 557.

Aphrodita pedunculata, *Penn. Brit. Zool.* iv. 45. pl. 24. f. 27, and edit. 1812, iv. 87. tab. 26. f. 2.

Aphrodita longirostra, *Bruguière, Encyclop. Méth.* vi. 86. *Bosc, Vers*, i. 182.

Aphrodita punctata, *Müll. Zool. Dan. Prod.* 218. *Bosc, Vers*, i. 182. *Jameson in Wern. Mem.* i. 558.

Polynoë squamata, *Savig. Syst. Annel.* 22. *Lam. An. s. Vert.* v. 309; 2nde édit. v. 544. *Stark, Elem.* ii. 139. *Aud. & M.-Edw. in Ann. des Sc. nat.* xxvii. 416. pl. 7. f. 10–16?; *Hist. Litt. de la France*, ii. 80. pl. 1. f. 10–16? *Johnston in Ann. Nat. Hist.* ii. 432, and v. 307. *Templeton in Loud. Mag. Nat. Hist.* ix. 234. *H. Rathke in Nov. Act. Cæsar. Curios.* xx. 149 (1843). *Williams in Rep. Brit. Assoc.* 1851, 237. f. 62. *Grube, Fam. Annel.* 36.

Eumolphe punctata, *Blainv. Dict. Sc. nat.* lvii. 458.

Polynoë scabra, *Johnston in Zool. Journ.* iii. 331.

Lepidonotus verrucosus, *Leach, Mus.*

Lepidonotus granularis, *Leach, Mus.*

Lepidonota punctata, *Oersted, Annul. Dan. Consp.* 12. f. 2, 5, 39, 41, 47 & 48; *Grœnl. Annul. Dorsibr.* 16; *Kroyer's Naturh. Tidsskr.* 112 (1842).

Hab. The coralline region: common.

Desc. Body generally about one, rarely two inches long, depressed, linear-oblong, of equal breadth at both ends, of a uniform cinereous colour, rough: scales twelve on each side*, rather large, ovate, im-

* They are placed over the 1, 3, 6, 8, 10, 14, 16, 18, 20 and 22 pairs of feet.

bricate, rough with brown granulations, ciliated on the external margin, the overlapped smoother than the exposed portion, for the granules on the former are more minute than on the latter; the anterior scales are smaller and rounder than the others, and completely cover the head, which is a subtriangular pink or purplish corneous plate, furnished with four small eyes: antennæ three, the central one largest, bulbous near the point: palpi two, longer than the antennæ, swollen near the apex; the tentacular cirri similar to the superior cirri of the feet; these are white, with a blackish ring at the bulb where the acumination commences, retractile, originating from above the dorsal branch of every alternate foot and under the scales; the last three pairs of feet each with a cirrus: feet twenty-five pairs, obtuse, sub-bifid, the dorsal branch shorter and less than the ventral, each terminated with a brush of stiff brown bristles, and under the ventral branch there is a small setaceous cirrus and also a fleshy spine at its junction with the belly: bristles when removed golden-yellow, those of the dorsal branch slenderest, gently curved, pointed, and serrulate for about half their length; those of the ventral branch stouter, slightly bent near the top, and serrulated with a double series of teeth on the outer side of the bend; they are similar to those of *L. clava*; each tuft of bristles enclosing a dark brown straight spine, the inferior stouter than the upper one: ventral surface straw-colour, prismatic, marked with the viscera, and sometimes spotted with black near the base of the feet.

This species differs remarkably from those which follow in the tenacity with which the dorsal scales adhere to their tubercles of attachment, from which they cannot be separated except by the dissecting-knife; and this fact determines the species to be almost certainly the *Aphrodita squamata* of Linnæus. His *Aph. scabra* must ever remain in uncertainty, for no *Polynoë* has twenty scales, as he states them to be in that species. The *Aph. scabra* of Otho Fabricius is said to have fifteen pairs of scales; and overlooking this important fact, I, on a former occasion, much too confidently identified it with the present; but the description is otherwise so very applicable, that, I must acknowledge, a suspicion of there being the same species still remains*. That this is the *Aph. scabra* of British authors scarcely admits of a doubt. It is much less certain whether it is the *Aphrodita clava* of Montagu; but as he has himself suggested their possible identity, and as his description and figure are both of them too imperfect to characterize a species, we see no harm in reducing his to a conjectural synonym. In the description, the scales are stated to be "twelve or thirteen pairs," but the figure shows thirteen scales on one side and fourteen on the other, with a naked space between the rows. Audouin and M.-Edwards conjecture that *Aph. clava* may be the same as their *Polynoë læris*, characterized by having fourteen pairs of perfectly smooth scales.

* Under the name of *Aphrodita squamata*, Sir J. G. Dalyell figures a specimen (Pow. Creat. ii. 166. pl. 21. f. 3) about 2½ inches long, and nearly one in breadth, which has "about thirteen pairs of scales." In the figure, fifteen pairs are represented, and it is very probably the *Aph. scabra* of Fabricius.

Obs. Of a uniform cinereous colour, and equal at both ends.
(*a*) Firth of Forth and South Devon, *Mus. Leach.*
(*b*) Firth of Forth, *Lieut. Thomas, R.N.*
(*c*) Berwick Bay, *Dr. Johnston.*
(*d*) Falmouth, *J. Cranch.*
(*e*) Weymouth, *W. Thompson.*
(*f*) Aberystwith, *J. Henslow.*

PLATE VII. Fig. 1. *Lepidonotus squamatus*, nat. size. 1 *a*. The jaws, slightly enlarged. 1 *b*. A scale magnified. 1 *c*. A spine magnified. 1 *d*. A bristle from the ventral branch of the foot magnified (not correct).

2. **L. clava**, scales subcircular, margined, not imbricate nor meeting on the mesial line, maculated, unciliated on the edge; tentacular and dorsal cirri bulbous below the point; bristles as in *L. squamatus*. Length $1\frac{1}{2}''$; breadth $4'''$.

Aphrodita clava, *Montagu in Linn. Trans.* ix. 108. tab. 7. f. 3.
Lepidonotus clavatus, *Leach in Supp. Encyclop. Brit.* i. 452.
Halithæa clava, *Templeton in Loud. Mag. Nat. Hist.* ix. 234.
Eumolphe squamata, *Blainv. in Dict. Sc. Nat.* lvii. 458, *Atlas*, t. . f. 2.

Hab. The coralline region.

Desc. Body 1–$1\frac{1}{2}$ inch long, $4'''$ broad, linear-oblong, equal and rounded at both ends, the back covered with scales touching or even a little overlapping on the sides, but not meeting or scarcely so in the mesial line; the venter perlaceous, separate from the feet by a depressed line, and marked across with dissepimental lines: head small, conoid, with four eyes: the palpi longer than the tentacula, with a very distinct bulb encircled beneath with a black ring near the apex, which is setaceous; tentacula similar, as are also the tentacular and anal cirri: scales twelve pairs, almost circular, the middle ones often ovato-reniform, permanently attached by a subcentral pedicle, margined, maculated with pale and dusky irregular spots, or almost uniformly leaden-coloured, smooth, except the two or four anterior pairs, which are often granulous, even and unciliated on the margin, and without a colourless edge: feet twenty-five pairs, stout, armed with strong yellow bristles, in a level-topped, fan-shaped, large fascicle; the dorsal fascicle small, with comparatively few, short, straight bristles tapered to a rather blunt point, where it is closely striated across: the ventral bristles have a smooth, cylindrical shaft bent towards the point, below which it is thickened a little, and strongly armed with two series of sharp (about thirteen) denticulations, the talon-like point being smooth and entire. Inferior cirrus short, with a setaceous point.

Obs. This and the preceding are allied, but very distinct. The *L. squamatus* is narrower in proportion to the length, with less-developed tentacula and tentacular cirri; and the scales overlap obliquely; whereas in *L. clava* they merely touch on the sides, and generally do not meet on the mesio-dorsal line. The scales differ in shape; and while those of *L. squamatus* are all granulous, the anterior pairs only

of *L. clava* are so, and never so thickly. In the structure of the feet and bristles, the two species are alike. There are twenty-five pairs of feet. The dorsal branch is short, with a comparatively small tuft of short bristles, gently curved and tapered to a rather blunt point, where the shaft is closely striated across. The ventral branch is much larger, obtusely pointed, with a flattened brush of strong yellow burnished bristles; the shaft smooth and cylindrical, bent towards the point, below which there is a thickened portion armed with sharp denticulations in close-set transverse series. (See figs. 5 & 6.)

(*a*) South Devon coast, *G. Montagu, Esq.*

(*b*) Falmouth, *W. C. Cocks, Esq.*

** Scales more than 12 pairs, deciduous. Vivacious.

3. **L. impar**, scales thirteen pairs, roundish or reniform, imbricate, granulous, ciliated on the external margin; antenna, tentacula and cirri tomentose, with fleshy papillæ; anal extremity narrower, with prolonged styles. Length 8‴. Plate VIII. fig. 3–9.

Polynoë impar, *Johnston in Ann. Nat. Hist.* ii. 436. pl. 22. f. 3–9. *Oersted, Annul. Dan. Consp.* 13. *Grube, Fam. Annel.* 36.

Hab. Between tide-marks.

Desc. Body linear-oblong, narrowing insensibly from the head to the tail, depressed, slightly convex on the back, of a freckled or mottled brownish colour. Head concealed by the foremost scales, square, sinuated in front, pale. Eyes very distinct, the posterior pair most approximated. Proboscis with four rather large, corneous, hooked maxillæ, the orifice encircled with a single series of simple filaments. Antennæ five, the central one setaceous, elongate, flesh-coloured; the middle pair very small; the outer pair as long and rather thicker than the odd one, but pale-coloured,—all of them appearing roughish when highly magnified. Scales thirteen pairs, covering the back entirely, some of them roundish, others subquadrangular, and others kidney-shaped, rough with miliary granules excepting where overlapped, and the external margin fringed with short cilia. Feet uniramous, armed with two fascicles of very stout bristles, the superior with the most numerous and longest bristles. Bristles all of them simple, the longest formed like a lance, the shorter curved like a scimitar towards their point, which is concave and serrulate along the edges: a single spine to each brush of bristles. Tentacular cirri alternating as usual, covered with short fleshy papillæ; the point of the cirrus suddenly acuminate, naked, and frequently spathulate. Tail with two of the filaments disproportionably elongated.

(*a*) Cullercoats, Northumberland, *Joshua Alder, Esq.*

PLATE VIII. Fig. 3. *Lepidonotus impar*, nat. size. 4. The head uncovered and magnified. 5, 5*, 6. Scales magnified. 7, 8. Two views of two feet, magnified; *b*, the tentacular cirrus. 9. Three bristles.

4. **L. pharetratus**, scales fifteen pairs, subcircular, imbricate and covering the back, clouded, smooth, with a series of granules on the margin which is ciliated; tentacular appendages smooth; feet about thirty-five pairs, the dorsal and ventral fascicle of bristles subequal; ventral bristle spinigerous on the upper half of the shaft, with an entire tarsiform point. Length $1\frac{1}{4}''$. Pl. III. figs. 17–19.

Hab. The littoral region: rare.

Desc. Body elliptic-oblong, convex dorsally, rather broader in front than at the tail, covered with scales beautifully variegated with yellow and purplish-brown disposed in small clouds, specks, and ocellated spots. Head concealed, perlaceous, bilobed, heart-shaped, being broadest and deeply emarginated in front. Eyes four, placed in a square, but the hinder pair are nigher than the anterior. Antennæ three, the central one like a short truncate process, the others bulged about the middle and ending in a setaceous point. Palpi two, greatly larger and longer than the antennæ, tapered from the base. Mouth with thick involute striate lips. Tentacular cirri similar to the palpi, but they were, with one or two exceptions, either retracted or torn away. Scales fifteen on each side, imbricate, meeting on the back so as to leave no naked space, smooth, with a series of small granules near the posterior and external margins, and the latter is densely ciliated with short hairs; under surface perlaceous and iridescent: the first pair are roundish, the others more or less kidney-shaped, the 13th concealed and considerably smaller than the 14th and 15th, which again are considerably less than the 12th. The scales are not deciduous like those of *L. cirratus*, but they are less firmly fixed than those of *L. squamatus*, and can be removed from their attachments with a little force, excepting the 13th and 14th pairs, which are irremoveable without injury. Abdomen flat, furrowed down the middle, smooth and perlaceous. Feet thirty-five pairs, but the crowding of the posterior renders an exact enumeration difficult: the stalk stout, scarcely biramous; the branches nearly equal, armed as usual with yellowish bristles forming a cuneate bunch. Bristles of the superior branch (Pl. III. fig. 17) unequal in length, but alike in shape and structure, stout, slightly curved, tapering to a sharp point; the inferior half of the shank smooth, the upper half serrated along the convex edge, and seemingly striated across; the apex smooth and tarsiform. The bristles of the inferior branch (fig. 18) rather longer, but not so stout as the superior, somewhat swollen near the middle, whence they taper to a longer and more decidedly tarsiform smooth apex, being armed underneath with a double row of strong serratures. Inferior cirrus shorter than the branch.

The only specimen I have seen is $1\frac{1}{4}$ inch long and $\frac{1}{10}$ths broad. It was found in a collection of worms made for me by Lieutenant Thomas, R.N., who does not mention the locality in which it was dredged.

I was in hope that, in this species, I had rediscovered the *Aphrodita scabra* of my favourite Otho Fabricius, but I cannot reconcile

his elaborate description with ours*. The species is interesting as connecting those *Lepidonoti* that have fixed scales with those that have them deciduous. In form and size, and in its structure and appendages generally, it closely resembles *L. cirrhatus*.

Obs. I have seen one specimen only, and it had lost most of its dorsal cirri. I cannot refer it to any described species, but it is closely allied to *L. assimilis* and *L. scabra*. The 13th and 14th pairs of scales seemed to be fixed like those of *L. squamatus*.

PLATE III. Figs. 17, 18, 19. *Lepidonotus pharetratus*. *a*. Bristles of the superior branch. *b*. Bristles of the inferior branch.

5. **L. cirratus**, scales fifteen pairs, ovate or reniform, imbricate, entirely covering the back, variegated or punctate, smooth, with a ciliated exterior margin; tentacular appendages smooth, incrassated below the point, and ringed with black; feet thirty-seven pairs; ventral bristles bidentate at the apex, and spino-denticulate on the shaft for about a third of its length. Length 1–1½″. Pl. III. fig. 2.

Aphrodita cirrata, *Fabric. Faun. Grœnl.* 308. tab. f. 7. *Bosc, Vers*, i. 183.
Aphrodita squamata, *Penn. Brit. Zool.* iv. 87, exclus. fig. *Dalyell, Pow. Creat.* ii. 166. pl. 24. f. 8.
Aphrodita imbricata, *Penn. Brit. Zool.* iv. 88. *Stew. Elem.* i. 388. *Jameson in Wern. Mem.* i. 558.
Aphrodita violacea, *Müll. Zool. Dan. Prod.* 218. no. 2645. *Turt. Gmel.* iv. 81.
Aphrodita plana, *Stew. Elem.* i. 388.
Aphrodita varians, *Dalyell, Pow. Creat.* ii. 167. pl. 24. f. 11, 12.
Polynoë imbricata, *Johnston in Zool. Journ.* iii. 332 & iv. 421.
Polynoë cirrata, *Aud. & M.-Edw. in Ann. des Sc. nat.* xxvii. 422; *Hist. Litt. de la France*, ii. 86. *Johnston in Ann. Nat. Hist.* ii. 434 & v. 307. *Sars in ibid.* xvi. 183. *H. Rathke in Nov. Act. Curios. Cæsar.* xx. 150 (1843).
Polynoë lepidota, *Johnston in Zool. Journ.* iii. 333.
Lepidonota cirrata, *Oersted, Annul. Dan. Consp.* 13. f. 43, *and in Kroyer's Naturh. Tids.* 111 (1842).
Lepidonotus planus, *Leach, Mus.*

Hab. The littoral region: common.

Desc. Body elliptic-oblong, somewhat narrowest posteriorly, about 1½ inch long, 3 lines broad, variously coloured, of a uniform olive, brown, or mottled, often marked with a series of pale spots along the sides, one to every scale, sometimes with a red band down the back, and sometimes pied with lighter and dark shades; belly perlaceous, with a red central line from a blood-vessel appearing through the skin. Head mostly concealed by the anterior scales, cordate, with an impressed line in the middle, pink-coloured or reddish, with four eyes placed wide asunder. Antennæ three, the medial largest,

* Oersted's description and figure show that the true *Aph. scabra* (*Lepidonota scabra* of Oersted) differs in having a head entire and pointed in front, pilose tentacula and palpi, and very rough scales. The bristles appear to be nearly alike in both species.—*Annul. Dorsibr.* 12. tab. 1. figs. 2, 7, 10, 12, 13, 17, 18.

all bi-articulate, swollen near the apex, which is acutely pointed. Palpi two, setaceous, with a suddenly acuminated point, paler coloured, stouter, and twice as long as the antennæ, somewhat annular. Tentacular cirri two pairs, similar to the medial antenna, the bulb ringed with black, the acute points pale. Scales fifteen pairs, imbricate, ovate or kidney-shaped, the anterior nearly circular, variously coloured and dotted, convex towards the centre, smooth to the naked eye*, but really roughish, with scattered short spines or processes visible only in certain lights or near the margin; they are attached to the 2nd, 5th, 6th, 7th, 9th, 11th, 13th, 15th, 17th, 19th, 21st, 23rd, 26th, 29th and 32nd segments by mammillary tubercles, considerably larger than the alternating branchial ones, and when removed, the back appears spotted over the base of the feet, the spots becoming quite distinct and regular near the tail, which is terminated by two styles. Superior cirri eighteen, bulbous near the apex, which is pointed, with a dark ring at the bulb, and blackish about the base. Feet thirty-six pairs, each with a small inferior cirrus, and garnished with numerous clear straw-yellow bristles, those of the dorsal branch shorter than those of the ventral, all slightly bent near the apex, which is minutely serrulate and acute. Spines simply conical. Bristles of the feet very similar to those of *L. semisculptus*; those of the ventral branch are bidentate at the apex, and armed with spinous denticles on one side as far down the shaft as where the thickened part begins.

The animal moves quickly by means of its feet in a somewhat undulating manner, the medial antenna being held erect and reverted, the palpi stretched forwards and inclined to the ground, which it examines by their aid†. When thrown into fresh water, it dies almost instantly, and the scales drop off; and even during life these organs are removed with so slight a friction, that it is not easy to take up a specimen without depriving it of one or more of them.

Of his *Aphrodita lepidota*, Pallas says, "Certe in mari inter Angliam et Belgium satis copiose occurrit hæc species, et ex fascia plerumque longitudinali nigra facile adgnoscitur." A *Polynoë* marked in this fashion is common on our shore, which answers well also to Pallas's, but our worm is certainly nothing more than a variety of the *P. cirrata*. Pallas, however, says that his *Aphrodita lepidota* has only fourteen pairs of scales, and were this point found to be correct, it would decide it, with us, to be a distinct species. We leave it to future inquiry. And let us here remark, that our *Polynoë cirrata* is not identical with the *Aphrodita cirrhosa* of Pallas‡, for he expressly says that the bristles of the dorsal branch of the foot are *longer* than those of the inferior branch (*Misc. Zool.* p. 96). The species are otherwise very nearly allied.

* The scales "seem vascular or susceptible of distension, and when detached, each resembles a flat drop of pale grey or purplish jelly. It is from the peculiar nature of the whole that the upper surface seems gelatinous."—*Sir J. G. Dalyell.*

† "The motion of the animal is very swift, half running, half swimming. But it likewise swims rapidly through the water, and with much more facility than any other of its tribe."—*Sir J. G. Dalyell.*

‡ This conclusion I now think is erroneous. Pallas's description of *A. cirrhosa* is not elaborated with his usual care, and his figure he himself criticises severely:

This species propagates in early spring. The eggs, according to Sars, seem to pass through a very small aperture just above the feet. Here they lie, protected beneath the scales, while the process of hatching proceeds; and when the fœtal worms are mature enough, they come forth from the mucus surrounding the eggs, leave their mother in successive parturitions, and swim freely about in the water, as very minute greenish-grey points, endowed with a lively action. They are then very unlike the mother both in form and in structure. They are short, oval, unarticulated objects, without any external organs excepting a circle of long cilia round the centre of the body. On the narrower and anterior portion there are two eyes, proportionably large. This portion is always put forward in swimming, which is done rapidly, and in all directions, by the action solely of the cilia that encircle the middle. "Frequently," says Sars, "these young animals revolve during swimming round their longitudinal axis. Their sight is distinctly developed, for they are seen to avoid one another with adroitness, and they always swim towards the light. Although I turned the glass containing an immense number of them in various ways, they immediately swam in great troops to the side turned towards the light." The appearances the worm assumes in the successive stages, from birth to maturity, are yet unknown.

Obs. Very variable in its colour and markings; and the variety with a purple or red fascia along the back, I formerly mistook for *A. lepidota*,—a species yet uncertain. The scales, to the naked eye, appear smooth and glossy, but they are really roughish, with minute spines only visible under a good magnifier.

(*a*) South coast of Devon, *G. Montagu.*
(*b*) Holy Island, *Dr. Johnston.*
(*c*) Rothesay, *Miss M'Douell.*
(*d*) Wick, Caithness, *C. W. Peach.*

Plate III. Fig. 2. *Lepidonotus cirratus*, nat. size. 2 *a*. The head; '. the antennæ; ". the palpi; "'. the tentacular cirri. 2 *c*. A scale. 2 *d*. The proboscis laid open. 2 *e*. A foot with a tentacular cirrus. 2 *f*. A foot without the tentacular cirrus.

6. **L. semisculptus**, scales fifteen pairs, imbricate, subcircular and reniform, rough, with granulations and a few warts on the margin and disk, the edge unciliated; ventral branch of the foot oblong, with a long pointed apex; bristles bidentate at the apex, and spino-denticulate on the shaft. Length $1\frac{1}{2}''$; breadth $4'''$.

Lepidonotus semisculptus, *Leach in Mus. Brit.*

Hab. South Devon coast, *J. Cranch.*

it has evidently been derived from a mutilated specimen. We shall not be able to identify the species of our early authors, unless we adapt to their descriptions a less exact measure of criticism than we are entitled to use with recent ones. De Blainville places the *Aph. cirrhata* of Pallas amongst doubtful species (*Dict. des Sc. nat.* lvii. 459).

Desc. Body a little narrowed posteriorly; the back covered with the scales; and the sides densely fringed with the yellowish bristles which protrude considerably. Head large, quadrangular; the eyes black, and the anterior pair rather wider apart than the posterior. Medial antenna longest; the palpi and tentacula smooth, rather incrassated than bulbous below the point, and unmarked with a black ring. Scales oblique, roundish or somewhat reniform, unciliated, clouded, rough, with minute granules which cover the entire surface, and with some larger conical tubercles on the posterior margin and scattered over the disc. Under a high magnifier the granules appear depressed or perforated on the top; and the tubercles arise within a circular circumscribed base. Feet thirty-nine pairs; the ventral branch oblong, with a long point, and the setaceous inferior cirrus reaching to the base of it. Dorsal bristles in a circular spreading tuft much shorter than the ventral, stout, gently curved, and tapered to a point, striate crosswise; ventral bristles in two fascicles separated by the pointed apex of the branch, stout, the shaft cylindrical, gently curved to a claw-like point, with a denticle immediately below, and strongly denticulated along the scooped side of its upper third. Anal styles rather short.

Allied to *L. setosissimus* and *scaber*. The scales in *L. setosissimus* (assuming the figure of Quatrefages to represent Savigny's species, *Cuv. Règn. Anim. illustr. Annel.* pl. 19. f. 2) are fringed with cilia; the ventral branch of the foot is obtuse, and its bristles are spino-denticulate to the very apex. *L. scaber* has also this lobe of the foot without a point; its bristles are not bidentate, and all the tentacular organs are villous.

(*a*) South coast of Devon, *J. Cranch*.

7. **L. pellucidus**, scales fifteen pairs, imbricate, thin and transparent, fringed sparsely with clavate hairs; antenna, tentacula, and dorsal cirri setaceous; ventral bristles bidentate, with about ten series of denticulations underneath. Length $\frac{1}{2}''$.

Polynoë pellucida, *Dyster in litt.*

Hab. The Laminarian zone. Tenby, *F. D. Dyster, Esq.*

No. XVIII.

31

Obs. "Eyes four: antennæ and cirri setaceous, without the spear-head termination of those of *L. squamatus*; and the setæ are essentially different. The scales are fringed sparsely with clavate hairs, much like the glandular hairs of plants. In the dorsal bundle of setæ are some very beautiful hairs like this (No. XVIII. fig. 31); and the longer bristles in the ventral tuft have a slightly curved point, a denticle of great delicacy beneath, and eight or ten bunches of denticulations beneath. The scales are excessively thin and transparent, so as to show the outline of the body beneath. Caudal styles prolonged. Worm very active."—*F. D. Dyster.*

8. **L. imbricatus**, scales eighteen pairs. Length $\frac{3}{4}''$.

Aphrodita imbricata, *Linn. Syst.* 1084.
Flache Aphrodite, *Müll. Wurm-Arten*, 181. tab. 14.
Aphrodita cirrata, *Müll. Zool. Dan. Prod.* 218.
Aphrodita viridis, *Montagu in Linn. Trans.* xi. 18. tab. 4. f. 1; *Ann. Nat. Hist.* ii. 437.
Polynoë foliosa, *Savign. Syst. Annel.* 23. *Aud. & M.-Edw. Litt. de la France*, ii. 89.

Hab. South coast of Devonshire, *Montagu*. Sir J. G. Dalyell had seen a specimen from the Scottish coast, "with at least eighteen pair of scales," *Pow. Creat.* ii. 166.

Desc. "Body long, greenish, with about thirty-six fasciculi on each side, and covered with eighteen pairs of squamæ, which appear a little speckled by reason of their being somewhat rugose: the fascicles are much divaricated, and between each scale is a fleshy filiform appendage, terminated by an extremely fine fibre: tentacula four, setaceous; eyes four, small and black."—*Montagu*.

The following have been indicated as British species, but from the imperfect notices given, they can neither be defined, nor identified with foreign species that bear the same names:—

Aphrodita squamata.

Under this name Sir J. G. Dalyell has figured a specimen (*Pow. Creat.* ii. 166. pl. 24. f. 3), about $2\frac{1}{2}''$, and nearly $1''$ in breadth, which had "about thirteen pairs of scales." In the figure fifteen are represented, and the species is probably *Lepidonotus scaber* = *Aph. scabra*, O. Fabricius.

Aphrodita lepidota.

Aphrodita lepidota, *Pallas, Misc. Zool.* 94. tab. 7. f. 15 *a*, *b*, & tab. 8. f. 1, 2. *Stew. Elem.* i. 388.

"Certe in mari inter Angliam et Belgium satis copiose occurrit hæc species et ex fascia plerumque longitudinali nigra facile adgnoscitur," *Pallas*, who says it has fourteen pairs of scales. Notwithstanding this assertion, I believe, as I concluded long ago, that *A. lepidota* is a mere variety of *Lepidonotus cirratus* deprived of a pair of scales.

Aphrodita minuta.

Aphrodita minuta, *Penn. Brit. Zool.* iv. 87. tab. 26. f. 4 = Aphrodita lepidota, *Turt. Brit. Faun.* 136.

Aphrodita annulata.

Aphrodita annulata, *Penn. Brit. Zool.* iv. 87. tab. 26. f. 3. *Stew. Elem.* i. 388. *Turt. Brit. Faun.* 136.

Aphrodita velox.

Aphrodita velox, *Dalyell, Pow. Creat.* ii. 169. pl. 24. f. 13.

"Length 4 or 5 lines; breadth a line: four distinct black eyes. About twenty pencils issue from each side, together with eight or ten aciculæ, extending much beyond them, from each side also. At first I believed the animal totally divested of scales, and that it was a mere skeleton, but I afterwards observed a double row of about ten vascular scales in each, covering the back, the sheaths and their pencils being almost invisible from extreme transparence, while the more solid organs seemed predominant from shining through them. There seemed to be an aperture in each scale."—*Dalyell.*

Lepidonotus floccosus?

Sir J. G. Dalyell had a specimen of a Lepidonotus "extending twenty lines, or nearly an inch and three-quarters," which had sixteen pairs of scales (*Pow. Creat.* ii. 166). Audouin and Milne-Edwards describe only one species with this number,—their *Polynoë floccosa.*

Polynoë semisquamosa.

Polynoë semisquamosa, *Williams, Rep. Brit. Assoc.* 1851, 201. f. 21.

3. POLYNOË.

Polynoë, *Oersted in Kroyer, Naturh. Tids.* 110 (1842); *Grœnl. Annul. Dorsibr.* 11.

Char. Body linear, of not less than seventy segments, covered forwards with small scales in pairs, the hinder portion naked; scales alternating with dorsal cirri: branches of the feet connate; bristles simple: inferior cirrus single. Has the other characters similar to *Lepidonotus.*

1. **P. scolopendrina**, scales fifteen pairs, not meeting on the mesial line; segments eighty-two and upwards; tentacula and tentacular cirri only a little thickened below the point, villous; body yellowish on the dorsum, with greenish spots, and muricate. Length 4″; breadth 4‴. Pl. IV. fig. 1–9.

Polynoë scolopendrina, *Savigny, Syst. Annel.* 25. *Aud. & M.-Edw. Litt. de la France*, ii. 92. *Johnston in Ann. Nat. Hist.* v. 307. pl. 5. *Grube, Fam. Annel.* 37.

Hab. Shores of the south of England and of Ireland.

Desc. Body linear-elongate, flattened, rounded in front and slightly tapered behind, attaining a length of nearly 4 inches, and about 4 lines in breadth; the anterior portion of the back scaly, the

posterior and larger portion naked, but muricated with small tubercles arranged in three rows, one down the middle, and one on each side above the bases of the feet: ventral surface smooth, grooved down the middle, more or less iridescent. Head concealed by the front scales, small, tumid, somewhat heart-shaped, situated in front, smooth and flesh-coloured; eyes two, very distinct, round and black, placed far back on the occiput and remote from each other. Antennæ three, the mid one originating in the sinus of the head, large and equal in length to the palpi, setaceous, with an abruptly acuminated point, downy, of a dusky colour, but pale and jointed at the base; the lateral antennæ are only about a third the size of the odd one, and of the same form and structure. Palpi two, awl-shaped, larger than the odd antenna, downy or ciliate, and of a straw-yellow colour. On each side of them there is a pair of tentacular cirri equal in length to themselves, but not so stout, and in every respect resembling the mid antenna. Mouth inferior, terminal, furnished with a protrusile proboscis, armed with four jaws of a horn colour, and encircled at the orifice with a series of short conical papillæ. Segments numerous, narrow, deeply incised on the sides, broader than deep. Scales deciduous, rather small, roundish, smooth, with a plain unfringed edge, of a greenish-grey colour, irregularly clouded, and covered with pale puncture-like dots. In all our specimens some pairs had been lost. Audouin and M.-Edwards say there are fifteen pairs, and they are affixed to every alternate segment after the fashion of the more normal species of the genus. The anterior pairs are imbricated and cover the back entirely, but the posterior pairs lie over the bases of the feet, and leave the back naked in the middle. Feet well developed, homologous; the dorsal branch represented by a mere tubercle, from which grows a fan-shaped brush of short stout equal bristles; the ventral branch conoid, protruded much beyond the dorsal, obliquely truncate, armed with a series of golden-yellow strong bristles, and with a small inferior cirrus which does not extend beyond the apex. Bristles of the dorsal branch somewhat curved, rather obtuse, rough on one side, and generally soiled with extraneous matter; those of the ventral branch more than twice as long, decreasing both in strength and length as the series descends to the belly, the two upper ones pointed like a lance, the rest like a hedge-knife, with two sharp denticles at the tip, and the inner edge of the curved part minutely serrulated. Spines yellow, tapered insensibly to a rather obtuse point, one to each brush of bristles. Tentacular cirri awl-shaped, abruptly acuminate, downy or ciliate, of a dusky or dark colour, with paler spots, reaching to or a little beyond the apex of the foot; all the feet posterior to the 31st pair are furnished with these cirri, but only those anterior to them which are destitute of scales. Tail without elongated styles.

It is difficult to describe the colouring of this fine worm. Of specimens preserved in spirits the ground colour is a straw or ochre-yellow, but the back is clouded and spotted with dusky olive-green, there being a row of spots down the middle, a line or band along each side, and another row of spots exterior to this above the bases

of the feet; and these markings correspond with the arrangement of the tubercles which roughen this surface. The number of segments is liable to vary. Audouin and Edwards say that there are 82 of them. In one specimen we found them to be about 80; but that which served for our figure, and which was twice the length of the other, had not less than 110.

(*a*) Falmouth.

Plate IV. Fig. 1. *Polynoë scolopendrina* of the natural size. 2. The head with its appendages, highly magnified; the front scales have been removed. 3. The proboscis laid open. 4. Section of a segment, showing the squamous feet; the scales have been raised and reverted. 5. A scale. 6. One of the cirrigerous feet. 7. A bristle of the dorsal brush. 8. The upper bristle of the ventral brush. 9. One of its under bristles.

4. PHOLOË*.

Pholoë, *Johnston in Ann. Nat. Hist.* ii. 428. *Oersted in Kroyer, Naturh. Tids.* 111 (1842); *Annul. Dan. Consp.* 14. *Grube, Fam. Annel.* 38.

Char. Body linear-oblong, the scales placed over every alternate foot; cirri none or rudimentary; proboscis with four corneous jaws, the orifice plain; antennæ five, unequal, distinct; palpi two, large: eyes two or 4: branches of the foot connate, the bristles of the superior capillary, of the inferior falcate.

1. Ph. inornata, scales covering the back partially, fourteen pairs, roundish or oval, smooth, spinous on the outer edge; eyes two. Length 6‴; breadth 1‴. Plate V. figs. 1–5.

Palmyra ocellata, *Johnston in Zool. Journ.* iii. 329.
Pholoë inornata, *Johnston in Ann. Nat. Hist.* ii. 437. pl. 23. f. 1–5.

Hab. The littoral region. Amongst Confervæ between tide-marks. Berwick Bay, rare.

Desc. Worm half an inch in length, scarcely a line in breadth, almost linear, but a little narrowed behind, rounded at the extremities, flattened, of a yellowish-brown colour, dusky along the sides, and marked there with a series of paler round spots indicating the point of fixture of the scales. Head small and obscurely defined, corneous. Eyes two, very distinct, black, placed backwards. Palpi long, conical, smooth, jointed at the base, pointing forwards. Antennæ five, the outer pair larger than the three intermediate, and fringed on the inner sides with a few fleshy spines; the odd antenna

* A Nereid:

"As Pholoë, most that rules the monsters of the main."
Drayton, *Polyolbion*, Song xx.

superior and small. Mouth inferior, provided with a firm cartilaginous proboscis armed with two pairs of jaws similar to those of the *Sigalion*, but the orifice appears to be plain. Body with about forty pairs of feet, which seem to be all alike and destitute of tentacular cirri, but we find two minute fleshy papillæ near their bases on both the dorsal and ventral sides. The feet are not distinctly divided into two branches, but there is a fleshy fold behind the apex, and within which the apex can be retracted. From this fold there originate two bundles of simple bristles, one dorsal and the other ventral, the bristles short; the apex itself is armed with a bundle of compound bristles, jointed near the point, and fashioned like those of a *Polynoë*; to each brush of bristles there is a conical spine placed in the centre of the brush. The back of the worm is partially covered with a row of scales placed over the bases of the feet down each side, but the middle of the back is naked. There are fourteen pairs of scales, some of them round, others oval, all spinous on the outer edge, smooth, raised in the centre. Belly smooth, flesh-coloured. Posterior extremity without styles.

PLATE V. Fig. 1. *Pholoë inornata* of the natural size. 2. The anterior portion of the body, magnified. 3. The proboscis laid open, magnified. 4. Two of the dorsal scales. 5. The foot.

2. **Ph. eximia**, scales twenty-six pairs, imbricate, covering the back, reniform, spinous on the posterior edge; eyes two; anal styles prolonged. Length 6‴.

Pholoë eximia, *F. D. Dyster in litt.*

Hab. Tenby, *Frederic D. Dyster, Esq.*

Desc. "Body about half an inch long, attenuated slightly towards the tail, which is obtuse. Scales twenty-six pairs, the second and twelfth inclusive marked with a dark irregular spot about the centre, reniform, armed with from six to ten stout hairs, which, from the twelfth pair of scales to the tail, extend towards the middle of the back, and give the worm a spinous appearance. Scales covering the back. Segments thirty-seven; the first pair of scales attached to the first segment, the eleven next to alternate segments, the fourteen last to every segment. Antennæ five, of about equal length, the median and external rather stouter than the internal pair. Ocular spots two. Tentacular cirri very thick at the base, and about four times the length of the antennæ, ringed. Tail terminated with two long subulate styles. Proboscis cylindrical, three times as long as broad; no appendages at the orifice. Jaws four, incurved, not denticulated. Dorsal bristles very slender, short, finely denticulated, disposed in a fan-like bunch. Ventral bristles much longer and thicker, the terminal joint slightly incurved, very finely denticulated both on the terminal joint and on the anterior portion of the summit of the shaft. Ventral setiferous tubercle large and well developed; the dorsal very small and inconspicuous."—*F. D. Dyster.*

5. SIGALION*.

Sigalion, *Aud. & M.-Edw. Litt. de la France*, ii. 103. *Cuv. Règn. Anim.* iii. 207. *Johnston in Ann. Nat. Hist.* ii. 428 & 438.

Char. Body linear-elongate, the scales and superior cirri coexistent on the same feet, the former placed over every alternate foot until the 27th segment, whence they follow uninterruptedly to the anal extremity: proboscis with corneous jaws; antennæ three; palpi two, large; eyes four, concealed: feet biramous: anal segment with two styles.

This genus is distinguished from every known Annelid by the coexistence of superior cirri and scales on the same foot. The body is elongate, depressed, almost linear, and formed of numerous segments. The disposition of the cephalic extremity is singular; for the head, in place of being exactly terminal, is overtopped by the first pair of feet, which are lodged underneath it, and more or less approximated to the mesial line. In our native species there are three cranial tentacula, but in a foreign species the odd one is wanting, and the lateral are always small, and lie upon the peduncles of the first feet. The palpi, on the contrary, are long, and are placed outside and under these feet, of which the two terminal cirri are pointed forwards, and may be mistaken for true antennæ. There appear to be no eyes. The mouth is inferior, and is the outlet to a proboscis similar to that of *Polynoë*, but armed with less powerful jaws. At the superior base of every foot there is a rounded protuberance which gives origin to a cirrus, and which also carries a scale on such feet as have this appendage,—a fact inconsistent with the theory which maintains that the scales are mere modifications of the cirri. On the anterior part of the body the scales appear and disappear on every other segment, but subsequent to the twenty-sixth pair of feet there is one to each segment, and two or more to the last two segments, so that their number is always considerable. The feet are distinctly divided into two branches; the superior branch terminated with a single brush of bristles, the inferior sometimes with one and sometimes with two, but the bristles are shorter. The inferior cirrus is very obvious, and is inserted far from the extremity of the foot. The appendages of the anal ring form two tentacular styles. As to the branchiæ, there is no trace of them at the base of the feet, and when Audouin and Edwards inform us that they seem to be replaced by the fringes which garnish the external margin of the elytra, they surely forget that these fringes are not more developed than they are in *Polynoë*, and their structure is very unlike that of a respiratory organ.

* Perhaps formed from σιγαλόεις—curiously or anomalously made—but *Sigalion* is a name of Harpocrates, the companion of Æsculapius and Hygeia, by whom physicians were obliged to swear that they would observe a religious silence in their profession. See Sprengel, Hist. de la Médecine, i. 136.

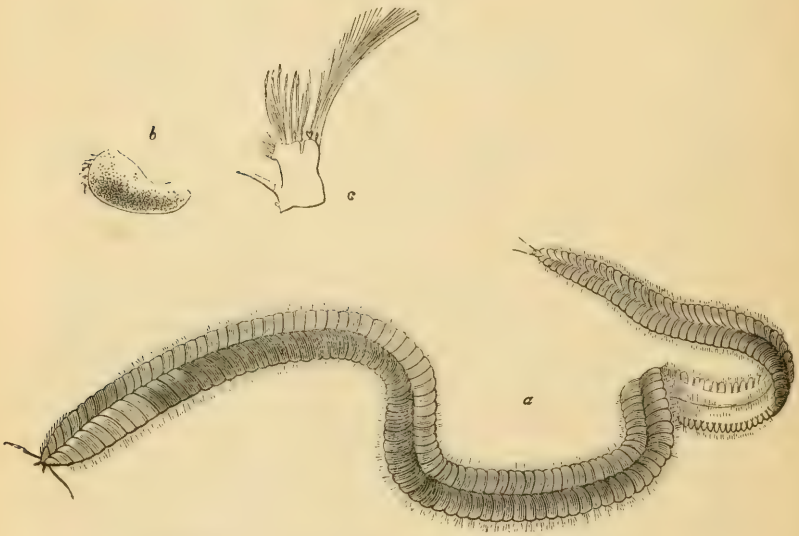
1. **S. boa**, scales entirely covering the back, reniform, roughish, ciliated on the external margin; lateral antennæ a common stalk, with three setaceous palpiform appendages articulated on its top. Length 8″; breadth 4‴. No. XIX. and Pl. V. fig. 6–15.

Sigalion boa, *Johnston in Loud. Mag. Nat. Hist.* vi. 322 (1833), f. 42, *and in Ann. Nat. Hist.* ii. 439. pl. 23. f. 6–15. *Williams, Rep. Brit. Assoc.* 1851, 201.
Sigalion Idunæ, *H. Rathke in Nov. Act. Acad. Cæsar. Nat. Cur.* xx. 150 (1843), tab. 9. f. 1–8. *Grube, Fam. Annel.* 38.
Nereis squamosa, *Leach, Mus.*

Hab. The littoral region near low-water mark.

Desc. Body seven or eight inches long, linear, flattened, slightly tapered towards the tail, the anterior extremity obtuse and somewhat rounded, the beak covered with two rows of scales of an ash or some-

No. XIX.



a. Sigalion boa of the natural size. *b.* A scale enlarged.
c. Side view of a foot magnified.

times reddish-brown colour, but as some of the scales are often paler or whitish, the body then appears piebald. Head small, convex, corneous, concealed by the rounded anterior pair of scales, terminated in front with three short setaceous two-jointed antennæ, the central one larger and longer than the others. Eyes none, but at the base of the least antennæ there are two depressed punctures very like eyes. Palpi two, setaceous, half an inch long, arising above and at the sides of the mouth. Mouth inferior, furnished with a retractile

cartilaginous proboscis about an inch long, armed with two pairs of sharp horny teeth plain on the margin, the aperture encircled with a double series of papillary tentacula, the outer series much longer than the inner, which however is the most numerous. Scales imbricate, kidney-shaped, convex, roughish, the concealed portion pale, the outer and larger margin fringed with very delicate hairs and some short anomalous processes; there are about 140 scales on each side, each affixed to a fleshy tubercle, from the end of which a tentacular filament is extended, equal to the feet in number, and placed exactly above them. Feet extremely numerous, obtuse, bifid, the superior branch papillary, with a brush of long unequal bristles curved upwards, the inferior branch truncate, somewhat sinuate, with two brushes of short bristles, and underneath with a setaceous cirrus equal to the superior. Bristles of superior branch setaceous, unjointed, serrulate on their upper half, with a spine in the centre of the brush; the bristles of the inferior branch are most of them stout, enlarged near the top, and terminated with a sort of claw toothed on the inner side; some of these are marked with a few circular striæ below the joint, and there is a spine in their centre; there are other more slender bristles which are two-jointed, the apical joint longish, acute, and smooth. Ventral surface pale, perlaceous, marked down the middle with a red vessel. Tail terminated with two short filaments. When killed in fresh water the scales readily drop off, and the relaxed body of a large specimen will then measure ten or twelve inches. Young individuals are generally of a light grey colour. When placed in a basin of sea-water it appears sluggish, but it burrows in loose sand with much rapidity, being enabled to do so by the play of its innumerable feet.

(*a*) South Devon, *Mus. Leach.*
(*b*) No locality.
(*c*) Holy Island, *Dr. Johnston.*
(*d*) Holy Island, *Dr. Johnston.*
(*e*) Loch Torridon, *Robert M'Andrew, Esq.*

Plate V. Fig. 6. The proboscis of *Sigalion boa* removed and laid open. 7. The head and anterior segments seen from above. 8. The head on the ventral aspect to show the mouth and origin of the palpi. 9. A scale from near the middle of the body. 10. A side view of a foot. 11. A bristle from the dorsal ramus of the foot, unjointed, but finely serrulated on one side. 12. Another bristle from the same ramus, slenderer and quite smooth. 13. A bristle from the indentation of the foot between the dorsal and ventral rami. 14. A bristle of the ventral ramus. 15. Another bristle of the same, situated under the former, and consequently next the ground.

Obs. The *Aphrodita arcta* of Dalyell (*Pow. Creat.* ii. 170. pl. 24. f. 14) may be a species of this genus, but it cannot be defined.

Fam. II. AMPHINOMENACEÆ.

Les Amphinomes, *Cuv. Règn. Anim.* iii. 198.
Amphinomea, *Blainv. in Dict. des Sc. nat.* lvii. 449. *Grube, Fam. Annel.* 39.
Amphinomæa, *Latr. Fam. Nat.* 241.
Amphinomæ, *Savigny, Syst. Annel.* 14 & 57. *Lam. Anim. s. Vert.* v. 327. *Stark, Elem.* ii. 135.
Amphinomiens, *Aud. & M.-Edw. Litt. de la France,* ii. 113.
Euphrosinidæ, *Williams, Rep. Brit. Assoc.* 1851, 174.

Char. Body oval, elongated, or even vermiform: head concealed, wedged in the post-occipital segment: eyes two or four: antennæ variable in number, the mesial one always present, inserted in front of a caruncle, with a base extended backwards to the third or fourth segment: mouth ventral; the proboscis without jaws or papillæ: segments similar, the feet biramous, with or without dorsal and ventral cirri: branchiæ large, in the form of arbuscles, tufts or crests, attached above or behind the dorsal branch of the feet, sometimes wanting on a few of the front pairs: bristles in a single fascicle to each branch, and without spines; the bristles simple.

6. EUPHROSYNE*.

Euphrosyne, *Savig. Syst. Annel.* 63. *Aud. & M.-Edw. Litt. de la France,* ii. 124. *Grube, Fam. Annel.* 41.
Euphrosine, *Cuv. Règn. Anim.* iii. 199. *Lam. Anim. s. Vert.* v. 331. *Stark, Elem.* ii. 136. *Blainv. in Dict. cit.* lvii. 452.
? Spinther, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 8.

Char. Body oval, depressed, of comparatively few segments: head small and narrow, retroflexed, with a caruncle and a single antenna in front: branches of the feet wide asunder, and with an additional cirrus near the middle of the interspace: branchiæ branched or arbuscular, placed behind the feet, and reaching in a line from one ramus to the other: anal styles small, globose: bristles slender, unequally forked at the end.

1. **E. foliosa**, the caruncle erect, linear; branchiæ of eight divisions not longer than the bristles, and enlarged and oval at their terminations. Length 1″.

Euphrosina foliosa, *Aud. & M.-Edw. Litt. de la France,* ii. 126. pl. 9. f. 1–4. *W. Thompson in Ann. & Mag. Nat. Hist.* ser. 2. iii. 355. *Gosse in ibid.* xii. 384.

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* One of the Graces. The name is familiar to the English reader:

"But come, thou goddess fair and free,
In Heaven yclep'd Euphrosyne."
Milton.

Hab. Coast of Ireland, and of the south of England. "Aug. 26, 1844.—A very handsome Aphrodite-looking species, dredged today by Mr. Hyndman off Castle Chichester, Belfast Bay, was brought to me. It was taken about a mile from the shore on shelly ground, in from six to ten fathoms water." "The specimen is an inch in length; the size attributed to the species by M.-Edwards. Two others, differing only in being smaller, were last year purchased by Mr. R. Ball (of M'Calle), but it was not stated on what part of the coast they were procured."—*W. Thompson.* Weymouth Bay, *P. H. Gosse.*

Desc. "The minute antenna at the tip of the caruncle appears to be flattened and truncate, instead of subulate; and the colours of the little animal are less vivid than those ascribed by its learned describers to *E. foliosa.* I should designate the hue of my specimen a bright cinnamon-red, rather than cinnabar, and the median line of the ventral surface is purplish. Its length is three-quarters of an inch."—*P. H. Gosse.*

2. **E. borealis,** body ovate-oblong, yellowish, hirsute; segments 26 or 27; caruncle elongate-oval; antenna one, semiglobose; branchiæ 9–10, bi- and tri-partite; dorsal cirrus none. Length $\frac{3}{4}''$.

Euphrosyna borealis, *Oersted in Kroyer, Naturh. Tids.* 113 (1842); *Grœnl. Annul. Dorsibr.* 18. f. 23–27. *Ray Soc. Rep.* 1845, 324.

Hab. Coast of Scotland? The specimen was found in a bottle of miscellaneous avertebrates given to me as British by R. M'Andrew, Esq.

Obs. The specimen in spirits is of a uniform cinereous colour. Its external appearance is so very similar to *Spinther oniscoides,* that their identity may be questioned. There are several particulars, however, in which the two worms differ so much, that I can only suggest my suspicion to lead to further inquiry. I have not seen a *second specimen* of the Spinther; and I must content myself with reproducing the original description without any alteration:—

Spinther oniscoides. Pl. VI. figs. 7–14.

Spinther oniscoides, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 8. pl. 2. f. 7–14.

Hab. Belfast Bay, in six to ten fathoms.

Desc. Body ovate or oblong, convex dorsally, flat and perlaceous on the ventral surface, of a uniform cream-yellow colour, rounded and obtuse at both extremities, which are so much alike, that, without a close examination, the anterior is not to be distinguished from the posterior. There is no head, tentacula, nor tentacular cirri. With a common magnifier we perceive that the back is crossed by numerous (about 30) narrow roughish edges (fig. 8), the roughness being produced by a series of minute bristles which scarcely protrude

beyond the skin. The ridges are regular and equidistant, and are continuous with the feet on each side. The feet form a close-set range round the body, interrupted only in front by a very narrow fissure, in which the mouth is situated. They are all alike, short and equal, formed of a single thick stump armed with a brush of bristles (fig. 10) that project very little beyond the margin, and are all glued together by a sort of albuminous membrane. There did not seem to be any cirrus above the foot, but at the root of each of them underneath there is a cirrus shorter than the foot itself, and with a large bulb at the base (fig. 11). The bristles are of three kinds; viz. (1) the spinous (fig. 12), sharp and fashioned like a needle; (2) the forked (fig. 13), which are filiform with a bulbous root, and cut into two scarcely equal prongs at the apex; and (3) the clawed (fig. 14), a bristle which has a stem slightly incrassated upwards, where a strong curved and sharp claw is articulated by an oblique joint. The forked bristles are the most numerous; and I did not observe more than one clawed bristle in each foot, but there were two or three from which the claw appeared to have been broken away. There are no anal styles.

I was indebted to my friend, the late William Thompson, Esq. of Belfast, for the specimen above described. It was half an inch in length, with a breadth fully one-half of the long diameter. It had, at the first glance, more resemblance to a Doris than to any Annelid; and when it was placed under a common magnifier, it was compared, aptly enough, to the *Cypræa europæa*, the comparison being suggested by the similarity in the ridges that cross the back. Another specimen, that had got soft by its maceration in a weak spirit, was three-fourths of an inch long and three-tenths broad; and the ridges on the back were more hirsute, and divided by a medial line. In this specimen the ventral surface was distinctly annulated.

The description is, in several respects, imperfect, but from the distinctness of the worm as a species, it will suffice for its future recognition. Observations on living individuals seem necessary to ascertain the number and nature of the oral appendages. That it is a member of the family Amphinomenaceæ I infer from its general habit, for it possesses few of the technical characters by which that family has been hitherto defined; and there is no one in the family nearly allied to it. In common with the Palmyra, the back is naked or without scales: there is nothing else in which the two genera agree.

PLATE VI. Fig. 7. *Spinther oniscoides* of the natural size. 8. The dorsal aspect viewed through a common magnifier. 9. A view of the ventral surface. 10. Two feet detached, and viewed from the back. 11. A foot as seen from below. 12, 13, 14. The bristles.

Fam. III. EUNICÆ.

Les Eunices, *Cuv. Règn. Anim.* iii. 199.
Eunicæ, *Savig. Syst. Annel.* 13 & 47. *Lam. Anim. s. Vert.* v. 320. *Stark, Elem.* ii. 137.
Eunicæa, *Latreille, Fam. Nat.* 239.
Euniciens, *Aud. & M.-Edw. Litt. de la France,* ii. 131.
Eunicææ, *Oersted, Annul. Dan. Consp.* 15.
Eunicidæ, *Williams, Rep. Brit. Assoc.* 1851, 174.
Eunicidæ, *Williams in ibid.* 229. f. 53, 54.
Eunicea, *Grube, Fam. Annel.* 41.

Char. Body vermiform: head distinct, small: proboscis short, plain at the orifice, furnished with several pairs of jaws articulated one above the other, and approximated beneath so as to rest on a sort of under-lip of the same horny or calcareous texture; the jaws of the right side less than those of the left: segments numerous, narrow, the first and second apodous, the latter occasionally with two tentacular cirri: branchiæ in the form of pectinated filaments, either straight or spiral, attached above at the base of the feet along a more or less extensive portion of the body, usually obsolete towards the extremities; and in some genera there are no branchiæ: feet uniform, uniramous, somewhat lobulated, with a dorsal and ventral cirrus, and with spines and fasciculated bristles: bristles simple and compound: anal segment with two styles.

The Annelides of this family render the connexion between the Amphinomians and the Nereides less abrupt than otherwise it seemed to be. The general form is linear-elongated, and almost cylindrical, but tapered posteriorly. The body is composed of very numerous annulations. The head is not overshot by the first pair of feet, as is the case in many Amphinomians. The eyes may be either distinctly defined, or they may not be demonstrable. The antennæ also vary much. In some species as many as seven and nine have been reckoned; in others there are five well developed; in others there are three or two only; and sometimes there are none. The mouth, which is inferior, is furnished with a proboscis armed in a manner that constitutes the most remarkable peculiarity of the family. It has never less than seven horny jaws; and there are sometimes eight and nine, with, in addition, a sort of support formed by two pieces of the same texture. The manner in which these jaws are articulated will be mentioned under the respective genera. The branchiæ are in the form of pectinated, or rather semipectinated, filaments, affixed to the base of the feet on the dorsal side, and forming a series on each side, more or less continued along the segments.

There are genera in which these organs are more developed, so as to form a sort of spiral tuft; and again there are species to which no branchiæ have been awarded. The feet are uniramous and furnished with spines, with one or several brushes of bristles, and with two cirri, of which the superior is the greater. The first two rings are, in general, apodous; and the place of feet is supplied by tentacular cirri.

Synopsis of Genera.

* *Feet with branchiæ.*

7. **Eunice.** Body linear-elongate: head distinct, with five antennæ: jaws seven: feet homologous: branchiæ semipectinate, fixed above the dorsal cirrus along a more or less considerable extent of the sides*: anal segment with two tentacular styles.

8. **Northia.** Body linear-elongate: head small and pointed, with two short conoid antennæ, and five tentacula: mouth with two pairs of thick fleshy palpi: jaws seven: branchiæ as in *Eunice*†.

** *Abranchial.*

† Antennæ developed.

9. **Lycidice.** Body linear-elongate, composed of numerous short segments: head distinct, exposed, broader than long, with three small antennæ behind, shorter than the head, approximate at the base: eyes at the base of the external antennæ: tentacula none, nor tentacular cirri: mouth with seven jaws, and an under-lip formed of two horny pieces: feet uniramous, with two fascicles of bristles: bristles of two kinds, simple, setose and compound, with a short beak-like piece: anal segment with four styles.

†† Antennæ none or rudimentary.

10. **Lumbrineris.** Body elongate, cylindrical: head distinct, naked, mammillate, without antennæ, or with rudimentary tubercle-like antennæ: eyes none: mouth with eight jaws in opposed pairs, and supported on a double stalk: feet uniramous, or with a single brush of bristles; the cirri short and thick.

* "Arranged in a prominent row of bright vessels, standing erect as florid visible combs at the dorsal base of each foot in the body, the branchiæ impart to all the species of this genus a graceful and characteristic appearance."—Dr. Williams.

† See Oersted's char. in Grœnl. Annul. Dorsibr. 19; and in Kroyer's Naturh. Tids. 113 (1842).

7. EUNICE*.

Eunice, *Schweig. Handb.* 597. *Aud. & M.-Edw. Litt. de la France*, ii. 137. *Williams in Rep. Brit. Assoc.* 1851, 196, *and in Ann. & Mag. Nat. Hist.* xii. 400.
Leodice, *Savign. Syst. Annel.* 48. *Lam. Anim. s. Vert.* v. 321.
Nereidonta, *Blainv. Dict. des Sc. nat.* lvii. 475.

Char. Head small, not overlooked by the first segment: eyes two: jaws seven, three in the right, and four in the left series: antennæ five, setaceous, unequal, longer than the head, and originating from its posterior margin: branchiæ semipectinate, affixed above the dorsal cirrus along a more or less considerable extent of the sides.

* Two tentacular cirri on the second segment towards the sides and near the anterior margin = Leodicæ simplices, *Savign. Syst. Annel.* 49.

1. **E. norvegica**, yellowish, with a reddish mesial line; front of the head bilobed; antennæ with distant joints indistinctly defined; branchiæ commencing on the seventh segment, with from three to nine to thirteen pectinations; dorsal cirrus elongated, overtopping the branchiæ. Length 4–6″.

Nereis norvegica, *Linn. Syst.* 1086. *Turt. Gmel.* iv. 87.
Nereis pennata, *Müll. Zool. Dan. Prod.* 217; *Zool. Dan.* i. 30. tab. 29. f. 1–3.
Nereis pinnata, *Müll. Zool. Dan. Prod.* 217; *Zool. Dan.* i. 30. tab. 29. f. 4–7. *Turt. Gmel.* iv. 87. *Fleming in Edin. Phil. Journ.* ix. 254. *Aud. & M.-Edw. Litt. de la France*, ii. 145.
Leodice pinnata, *Savign. Syst. Annel.* 51. *Lam. An. s. Vert.* v. 323; 2nde édit. v. 563.
Leodice norwegica, *Savign. Syst. Annel.* 51.
Eunice norwegica, *Grube, Fam. Annel.* 44.

Hab. The Laminarian region.

Obs. I have followed Oersted and Grube in uniting the above synonyms; for, it is to be presumed, they are best acquainted with the Müllerian species. I have seen no specimen.

2. **E. annulicornis**, brownish, iridescent; head rounded in front, obtuse; antennæ moniliform; branchiæ commencing on the fourth segment, with from three to seven pectinations, short; dorsal cirrus not longer than the branchiæ, jointed; anal styles elongate, moniliform. Length 4″.

Leodice annulicornis, *Brit. Mus. Coll.*

Hab. "Spinola," *Brit. Mus.* Is it British?

Desc. Worm lumbriciform, narrowed posteriorly, of a brown

* A Nereid.—Spenser calls her the "white-hand Eunice."

colour, unspotted, but margaritaceous. Head obtuse, rounded in front. Antennæ five, moniliform, with a globular joint at the base, setaceous, in proportions similar to *E. Harassii*, and nearly twice as long as the post-occipital segment. The tentacula jointed, as long as the transverse diameter of the segment. Branchiæ commencing on the third segment, and continued down the sides until near the tail; they are small, short, with about nine pectinations in their fullest development. Segments narrow, divided by an impressed suture; the dorsum very smooth, iridescent; and the ventral surface is equally so, especially at the sutures. Anal segment with two elongated submoniliform styles. Bristles, in their position, black.

Obs. Of the size of the preceding, but more allied to *E. antennata*. The antennæ are so distinctly moniliform, that they resemble those of a beetle, but the joints are uncertain in number. The nuchal tentacula are also jointed, as well as all the dorsal cirri. The segments are divided by deep sutures, smooth, unspotted; and the dorsal cirrus is shorter than one-half of the diameter of the segment.

(*a*) Spinola.

3. **E. antennata**, brownish, iridescent; head bilobed in front; antennæ moniliform; cirri only less decidedly moniliform; branchiæ commencing on the eighth segment, short, with about seven pectinations at most; dorsal and ventral cirrus reaching the apex of the foot; anal styles moniliform. Length 2–3″.

Leodice antennata, *Savign. Syst. Annel.* 50. *Lam. Anim. s. Vert.* 2de édit. v. 562.
Nereidonta antennata, *Blainv. Dict. des Sc. nat.* lvii. 476.
Eunice antennata, *Audouin & M.-Edw. Litt. de la France*, ii. 145. *Griffith's Cuv.* xiii., *Annel.* pl. 7. f. 1. *Williams, Rep. Brit. Assoc.* 1851, 209.

Hab. "Found on the coralline to which *Pentalasmis tenuis* adhered," *Brit. Mus.*

Obs. The Museum specimen is in bad condition, but its identification with Savigny's species cannot be doubted. The branchiæ rapidly develope themselves, the third or fourth pair being complete; and they continue thus on the twenty succeeding segments, when they rapidly decline and disappear. The first segment is as broad as the three following.

(*a*) In spirits. No locality stated.

4. **E. Harassii**, vinous-brown, with a series of white spots down the dorso-mesial line (one to every segment), and spots on the sides and over the bases of the feet; head bilobed; antennæ annulated; branchiæ commencing on the sixth segment, with about eleven pectinations where most developed; dorsal cirrus not longer than

the branchiæ; anal styles short. Length 4–7″; as thick as a quill.

Eunice Harassii, *Aud. & M.-Edw. Litt. de la France*, ii. 141. pl. 3. f. 5–7 & 10, 11. *Grube, Fam. Annel.* 44.
Leodice punctata, *Risso, l'Europ. Mérid.* iv. 421.
Leodice fasciata?, *Risso, ibid.* iv. 421.

Hab. Southern shores of England.

Desc. Body vermiform, subcylindrical, narrowed posteriorly, of a yellowish-brown colour, with a series of milk-white spots along the middle of the back, one to every segment, and there are several less defined spots along the sides and above the bases of the feet. (Post-occipital segment about equal in longitudinal and transverse diameter, narrower than the following segment, with three whitish spots on the front line, which is even and entire.) Head of two prominent oblong lobes in front of the first segment, and over the mouth. Antennæ five, distinctly annulate, setaceous, the central longest, the lateral next in length, and the exterior shorter. Mouth ventral, with a thick lip, plaited on the ventral side. Post-occipital segment very short, apodous, smooth, with a setaceous tentaculum on each side from the anterior suture. Segments short, very distinct and numerous, faintly iridescent or non-iridescent on the dorsal, but perlaceous on the ventral surface, which is furrowed with a mesial groove. Feet prominent, the first four abranchial, all somewhat lobulated, furnished with a superior and inferior cirrus extending beyond the setigerous branch. The branchiæ begin on the seventh segment; they are semipectinate, with, at their full development, about eleven filiform branches rather distantly placed; the anterior and posterior pairs have few branches. Bristles in four fascicles; those of the upper fascicle unequal, long and flexile, simple, smooth and setaceous; those of the second short, stout and compound, the shaft thickened upwards, obliquely truncate; the apical joint falcate, concave on the inner side, and denticulate; the fascicle inferior to the second is small, and consists of bristles similar to the first; and the ventral fascicle is made up of bristles like those of the second. Anal segment with two short styles. Length 4–7″; as thick as a quill.

Obs. The antennæ, although jointed, are not moniliform. The bristles are in four small fascicles, the bristles of the superior and third being alike, and very different from those of the second and fourth. The former are simple, long, flexile, smooth and setaceous; the latter are compound, comparatively short, stout, the shaft thickened upwards and obliquely truncated, where the apical short joint is articulated: this is falcate, concave on the inner side, and somewhat denticulate.

(*a*) Falmouth.

5. **E. gigantea.**

Dr. Williams mentions this as a native of the south coast of England,—"a worm which probably attains less gigantic proportions in this country than in the southern parts of the coast of France."—*Rep. Brit. Assoc.* 1851, 184. Dr. Williams afterwards informs us that he had never found an example of the species on our coasts!—*Ibid.* 209. It is well figured by Blainville in the 'Faune Française,' Chetopodes, pl. 14.

** No tentacular cirri on the second segment.

6. **E. sanguinea**, head bilobed in front; antennæ smooth; branchiæ commencing about the 20th, and ceasing about the 155th segment, with four or five pectinations; dorsal cirrus scarcely reaching beyond the setigerous foot; ventral cirrus bulged at the base, and rounded at the apex. Length 15″ or even 24″; as thick as a man's finger.

Nereis sanguinea, *Montagu in Linn. Trans.* xi. 20. tab. 3. f. 1.
Nereidonta sanguinea, *Blainv. in Dict. des Sc. nat.* lvii. 477, *Atlas*, pl. fig. 2.
Leodice sanguinea, *Lam. An. s. Vert.* v. 323; 2nde édit. v. 563. *Stark, Elem.* ii. 137.
Leodice opalina, *Savign. Syst. Annel.* 51.
Eunice sanguinea, *Aud. & M.-Edw. Litt. de la France*, ii. 147. *Fleming in Encyclop. Brit.* edit. 7. xi. 219.

Hab. South coast of England, near low-water mark.

Attains the length of 15″ or even 24″, with the thickness of a man's thumb; and from its bright colouring when alive, and the highly margaritaceous iridescence which even dead specimens retain, the worm is certainly the Saul of its tribe. The head is small, formed of two globular lobes. Antennæ five, setaceous, subequal, smooth. Mouth inferior, powerfully armed. Post-occipital segment twice as long as the following, smooth, plaited on the ventral side. Second segment narrow, apodous. The eight succeeding segments have small lobular feet, which become larger on the next twenty, and these are all abranchial. The branchiæ are at first small, and gradually attain their maximum development about two-thirds of the entire length of the body, when they again diminish in size as they approach the tail, the segments of which are ebranchial. Anal segment with two styles. The body is depressed, and nearly equally convex on both surfaces. The segments are narrow, smooth, or somewhat rugose transversely, which may be owing to the action of the preservative fluid; and the nacred skin glows with green, blue, and yellowish reflexions.

Desc. "Body long, slightly depressed beneath, and acuminated towards each end, but much more so at the posterior extremity; the

number of joints exceeds 270, about forty of which at the posterior end are of a much paler colour, and appear to be a reproduction; the rest of the body is of a fine bronze, resplendent with changeable prismatic tints; the sides furnished with tridentate peduncles, from the middle of which issue a flat fasciculus of hair of a pale colour, and one large black bristle. About the 28th joint commence on each side branched cirri of a blood-red colour, which afterwards increase considerably in length; these originate from the upper part of each peduncle, and are usually hexafid, but unite above the base; they are not retractile, but are generally carried erect and spread, giving the animal a beautiful appearance. The upper lip is bilobate, behind which are five short tentacula, the middle one standing in the suture of the lip: between the two outer tentacula on each side is a small black eye. The first joint behind the head is broader than the rest, and destitute of peduncles. The posterior extremity is furnished with two small terminal cirri. The mouth is large and placed beneath, concealing most formidable jaws, or complicated fangs, which were protruded occasionally as the animal became sickly, and very frequently in the agonies of death when a few drops of spirits were added to the sea-water. This apparatus consists of three pairs of hooked fangs of a dark colour, one pair smooth, the others toothed, besides a pair of broad plates on the lower part of the mouth."

"This is the largest species of *Nereis* yet discovered to inhabit the British shores, extending sometimes to 14 or 15 inches in length, and large in proportion. It inhabits rocky situations, and is found lurking under the broken fragments; but is rare*.

"While the animal was in a glass of sea-water, the circulation of the colouring secretion, through the ramifications of the cirri, was a curious object, and appeared to be effected at the will of the animal; but when it became sickly, the circulation was slower, rising up through the branches of the cirri gradually, as in capillary tubes; and as soon as it expired, all the colour from these parts vanished." —*Montagu*.

(*a*) Falmouth, *W. C. Cocks, Esq.*
(*b*) South Devon, *Mus. Leach.*
(*c*) Falmouth, *W. C. Cocks, Esq.*
(*d*) Falmouth.
(*e*) South Devon, *G. Montagu.*
(*f*) Falmouth.

7. E. margaritacea.

Eunice margaritacea, *Williams in Ann. & Mag. Nat. Hist.* ser. 2. xii. 408. pl. 14. f. 4.

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* Viviparous? See Ann. des Sc. nat. x. 159 (1848).

8. NORTHIA.

Onuphis, *Oersted, Grœnl. Annul. Dorsibr.* 19. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 7.

Char. Body scolopendriform: head exposed, distinct, with two short thick antennæ, and five greatly elongated tentacula, two in front, and three across the occiput: eyes two, posterior: the first two segments dissimilar to the following, furnished with a superior and inferior cirrus, and with strong bristles, partly straight and partly hooked at the apex: the succeeding segments have three kinds of bristles, one stout, straight, and uncinate,—another slender, curved, and setaceous,—and another of small size, with a funnel-shaped apex. Tubicolous.

Obs. From the absence of pectinate branchiæ, which are present in *Onuphis*, I have placed the following species in a new genus, the character of which is borrowed principally from Oersted.

1. **N. tubicola**, the tube quill-like and horny, smooth and transparent: posterior tentacula annulated at the base only.

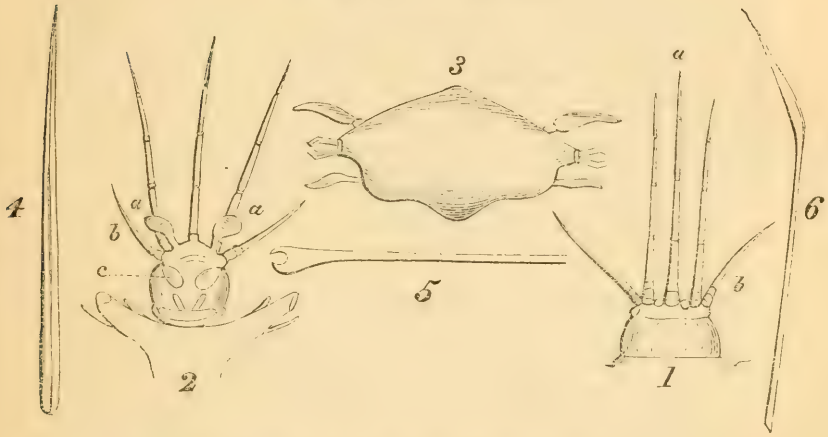
Nereis tubicola, *Müll. Zool. Dan. Prod.* no. 2625; *Zool. Dan.* i. 18. tab. 18. f. 1–6. *Turt. Gmel.* iv. 87. *Aud. & M.-Edw. Litt. de la France*, ii. 154. *W. Thompson in Rep. Brit. Assoc.* 1843, 76. *Peach in ibid.* 1844, 64; *Ray Soc. Zool. Rep.* 1847, 508.
Leodice tubicola, *Savign. Syst. Annel.* 52.
Nereidonta tubicola, *Blainv. Dict. Sci. Nat.* lvii. 477.
Onuphis tubicola, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 6. fig.
Eunice tubicola, *Fleming in Encyclop. Brit.* edit. 7. 219. pl. 275. f. 14 & 17. *Landsborough, Excurs. Arran*, 49.

Hab. The coralline region.

Desc. Worm linear-elongate, somewhat compressed, but convex on both dorsal and ventral surfaces, which are smooth and polished; the colour a uniform yellowish-brown, finely iridescent. Head (No. XX. fig. 2) narrow, sinuated in front, with five much-elongated tentacula annulated at the base, the outer pair shorter than the three posterior by one-half. Eyes behind the base of the tentacula. Occipital segment without any appendage. Segments (fig. 3) narrow, the length about a third of the transverse diameter. Foot uniramous, with two fascicles of bristles, each fascicle with a spine (fig. 4), two forcipate spinets (fig. 5), and many lanceolate slender bristles (fig. 6), the upper half bent aside from the line of the shaft, setaceous, and sharp-edged. Superior cirrus setaceous, not projecting beyond the foot on the anterior segments, but becoming considerably longer on the posterior, annulated at the base. Inferior cirrus shorter, but setaceous. Anal segment with two styles.

The worm lives in a tube which has a singularly exact resemblance to the barrel of a quill. It is about 4 inches long, and the upper portion is thinner than the lower, which is tough, and not easily cut with a knife. I made a vain attempt to form it into a pen.

No. XX.—*Northia tubicola.*



1 *a*. Cephalic segment with three long subulate tentacula.
1 & 2 *a*, *b*. Tentacular cirri.
2 *c*. The mouth, upper lip, formed of two large egg-shaped tubercles.
3. Section of anterior part of body, showing the cirrus above and below the foot.
4. A spine, one on each fascicle of the foot.
5. Forceps, two on each fascicle of the foot.
6. Lanceolate bristles, many on each foot, curved at the tip, and very sharp and double-edged at the point of curvature.

Let us see if, in its curious structure, we can find a key to the habits of the animal. We learn from Müller that it lives in soft mud, and one unceasing object of its life is the capture of prey. For this end, it must protrude the anterior portion of the body beyond its tube, and raise itself above the surface of the mud,—and remain, in this position, on watch. To enable the worm to do this with ease, is, I conjecture, the office of the forceps-like bristles of the feet: with their ends, it may hook itself to the rim of the tube, and thus obtain a support without the waste of muscular power. A long watch is thus rendered less irksome, while at the same time the capacity to seize upon a passing prey is increased.

The prey caught, analogy leads us to conclude that the worm will instantly retreat and sink within its tube, where it can feed without disturbance or fear. But as the entry and passage are narrow and unyielding, it seems to follow that the prey should be held by the mouth alone when in the act of being dragged within the tube, and

hence surely the reason that the mouth has been furnished with the hard tubercles to the lips; for, when pulled together and put in contact, they must give a firmer gripe and hold than could otherwise be taken.

The use of the tube is to protect the body from the pressure of the soft mud in which it stands immersed. When the tube is overset or cast out by the waves or accident, the worm leaves it, and becomes, in its turn, exposed to enemies. To protect itself from these while a new tube is being secreted, nature has amply furnished the Sao with a series of bristling lances on each side. These arms are of exquisite make, very fine and very sharp; and those of the upper bundle have their points bent and inclined towards those of the lower bundle, which are likewise bent to meet them. Arms like these will inflict wounds on the tiny assailants of the Sao sufficiently painful to repulse them; and a lethal wound is unnecessary.

(*a*) Plymouth Sound, *C. Prideaux.*

(*b*) Scotland, *Lieut. Thomas, R.N.**

2. **N. conchylega,** the tube flattened, free, formed of agglutinated fragments of shells and gravel: posterior tentacula on a short basal joint.

Onuphis conchylega, *Sars, Beskr.* 61. tab. 10. f. 28. *Grube, Fam. Annel.* 44.

Sabella compressa, *Mont. Test. Brit.* 555. *Turt. Brit. Faun.* 203. *Penn. Brit. Zool.* edit. 1812, iv. 372.

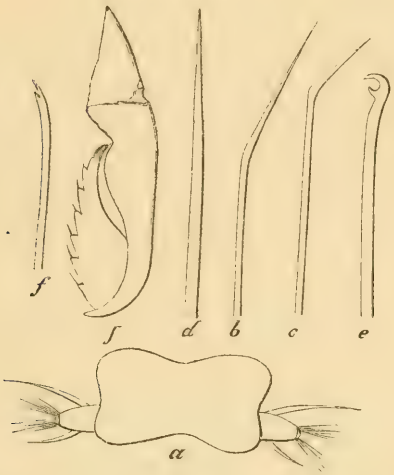
Hab. The coralline region.

Desc. Worm scolopendriform, a little narrowed towards each extremity, convex dorsally, more flattened on the ventral surface, and furrowed as usual in the median line; of a yellowish-brown colour, with faint iridescent lines across in the sutures. Head small, distinct, with two lobe-like palpi, and five greatly, but unequal, elongated tentacula. Eyes two, lateral, placed backwards. Segments numerous, narrow, subequal, with a protuberant foot on each side. The first and second pairs of feet project forwards, like buttresses, on each side of the head, and reach a little beyond its front margin. These feet (No. XXI. fig. *a*) are armed each with about four strong simple bristles (fig. *b*) curved slightly at the apex, which is strong and not very acute. The feet which follow protrude laterally, and are armed with an elongated dorsal and ventral cirrus, and with two small brushes of bristles. These bristles are all simple, smooth, slender, but unequal, the linear shaft bent obliquely so as to form a sort of falciform point (fig. *b*). There is a spine (fig. *d*) in each brush, distinguished by its straight figure. There appear to be about fourteen rings thus furnished, when suddenly their character

* Lieut. Thomas, R.N., has repeatedly seen the worm turn itself in its tube. To do this the head is reverted, and pushed down within the tube, between the wall and the body. The body is dragged in the same course, until the reversion is completed, and the head occupies the end that had been occupied by the tail.

changes, for the remainder of the body is soft, with rather broader rings, full of a glairy mucus, and of egg-like bodies that communicate

No. XXI.



a mottled appearance to it. The feet of these rings are slightly protuberant, and the bristles, although all simple, are of four sorts:—1st, the spines; 2ndly, some with a short curved sharp point (fig. *c*); 3rdly, others with a more elongated point (fig. *b*); and 4thly, two with a strong shaft and a forcipate apex (fig. *e*).

Between the two species of *Northia* there is a very exact resemblance in the form of the head and its various appendages, so that it would be difficult to obtain in them a character by which they might be distinguished. *Northia conchylega* has seven jaws, exclusive of the two pieces that constitute the under support; and the jaws are serrated with obtuse denticulations (fig. *f*).

The tube of *Northia conchylega* is fully 3 inches long and $\frac{5}{10}$ths broad, flattened like the scabbard of a sword, open at both ends, and constructed of fragments of old bivalve shells, of echini, and of gravel rudely agglutinated together, and encasing the proper case of the worm*: this is membranous, tough, and quite smooth. To fabricate the tube, the creature has the property of secreting a large quantity of a colourless glairy fluid, which is so tenacious that it may be drawn out into threads a foot in length without breaking.

(*a*) Berwick Bay, *Dr. Johnston*.

(*b*) South Devon, *J. Cranch*.

* It resembles the tube of *Onuphis Eschrichtii* of Oersted exactly (Grœnl. Annul. Dorsibr. f. 45), but the two species are otherwise distinct.

9. LYCIDICE.

Lycidice, *Savigny, Syst. Annel.* 13 & 52. *Cuv. Règn. Anim.* iii. 200. *Lam. An. s. Vert.* v. 324. *Stark, Elem.* ii. 137. *Aud. & M.-Edw. Litt. de la France*, ii. 159. *Williams in Ann. & Mag. Nat. Hist.* ser. 2. xii. 401.
Nereidice, *Blainv. in Dict. des Sc. nat.* lvii. 474.

Char. Body linear-elongate, slender, composed of numerous short, almost equal segments: head distinct, exposed, broader than long, with three small antennæ behind approximated at the base, shorter than the head: eyes two, at the base of the exterior antennæ: no tentacula nor tentacular cirri: mouth armed as in *Eunice*: feet uniramous, with two fascicles of bristles; the bristles of one slender and setaceous, of the other stouter, compound, with a short beak-like piece articulated at the apex: anal segment with four very short styles.

1. **L. Ninetta**, head bilobed in front inferiorly; dorsal cirri subulate. Length 3–5″.

Lycidice ninetta, *Aud. & M.-Edw. Litt. de la France*, ii. 161. pl. 3 B. f. 1–8. *Cuv. Règn. Anim. Illustr. Annel.* t. 11. f. 1. *Williams, Rep. Brit. Assoc.* 1851, 231.

Hab. The littoral region. South of England.

Desc. Worm lumbriciform, as thick as a small quill, scarcely tapered at the extremities, which are nearly alike. Head small, obtuse and emarginate in front, inferiorly bilobed. Antennæ, from the posterior margin, approximated, very short and papillary, the mesial one a little longer than the others. Eyes two, at the external base of the lateral antennæ. Segments numerous, narrow, nearly alike, separated by an impressed suture, smooth, almost cylindrical, with short protuberant feet; the first segment is twice as long as the second, and both are apodous. Feet abranchial, tuberculate, gradually attaining their full development; the bristles colourless. Bristles of superior fascicle long and setaceous, curved more or less above the middle, whence they are brought to a very sharp point; bristles of inferior fascicle compound, comparatively stout, the shaft cylindrical, incrassated upwards and cut obliquely at the top, where there is articulated a short beak-like piece concave on one side and obsoletely denticulated, as is well represented in the figure we have quoted. This terminal piece is easily detached, and is hence often not to be observed. The spine of the upper fascicle is of the usual character, chestnut-brown, with a colourless base; but in the lower fascicle the spine is colourless, different in form, and minutely bidentate at the top. Anal segment semioval, with very short styles. Specimens in spirits are of a uniform yellowish-brown or even cream-yellow.

(*a*) South Devon, *G. Montagu.*
(*b*) Falmouth.

2. **L. rufa**, head obtuse, bilobed; the fourth segment pellucid-white, slightly swollen, forming a sort of collar, which appears in some degree to sheath those before it, in contraction. Length $1\frac{1}{2}$–$2''$; breadth $1'''$.

Lycidice rufa, *Gosse in Ann. & Mag. Nat. Hist.* ser. 2. xii. 385.

Hab. "Found on an oyster dredged off Lee, near Ilfracombe."—*P. H. Gosse.*

Desc. "Length $1\frac{1}{2}$ in. to 2 in.; width $\frac{1}{12}$ in. Segments seventy. Body subcylindrical, almost equal in thickness throughout, and not at all diminishing posteriorly. Head of two rounded lobes, notched rather than divided. Eyes two, round, black. Antennæ three, of the same form and size, rounded and constricted at the base, conical, pointed, white; the central one in advance of the others, without any accessory tubercle. First segment about half as long again as the following. The feet commence on the third segment. The fourth segment is pellucid-white, slightly swollen, and appears in some degree to sheath those before it, in contraction. Feet rounded and obtuse. Superior cirri conical, reaching just beyond the foot; inferior cirri small. Bristles white; aciculi black: they continue to the very last segment, which is as large as the rest, truncate, with a central depression, with no terminal styles or tubercles. Jaws deep black, visible through the rings, but often protruded, and widely expanded. Colour above indian-red, each segment studded with numerous white round dots; some of these begin, about the fifteenth segment, to arrange themselves in a line across the middle, and this transverse line becomes more conspicuous on the following segments, and forms a ridge. The crimson contents of the dorsal vessel are visible as a medial dark red line down the body. Head whitish, dotted with brown. Under-parts pearly, mottled with purplish-red on the anterior half.

"The bristles of the ventral bundle are of the form which MM. Audouin and Milne-Edwards have called 'poils en serpe,' the staff of which is dilated at the extremity and very obliquely truncate, and the accessory piece knife-shaped, with the tip and the keel projecting, and a small but well-marked straight tooth near the tip; a slender lamina just embracing all. This form differs specifically from that figured by them as belonging to *Lycidice ninetta*."—"Others are simple lancets," "except that the dilated head has but one curvature, and that the point is drawn out to much greater length and fineness."—*Gosse.*

(*a*) Falmouth.

10. LUMBRINERIS.

Lumbrineris, *Blainv. in Dict. des Sc. nat.* lvii. 486. *Aud. & M.-Edw. Litt. de la France*, ii. 164.
Lumbrinereis, *Edwards in Lam. An. s. Vert.* 2nde édit. v. 566.
Lumbriconereis, *Grube, Fam. Annel.* 45.

Char. Body elongate, cylindrical, with numerous narrow segments, the first and sometimes the second apodous: head exposed, in the

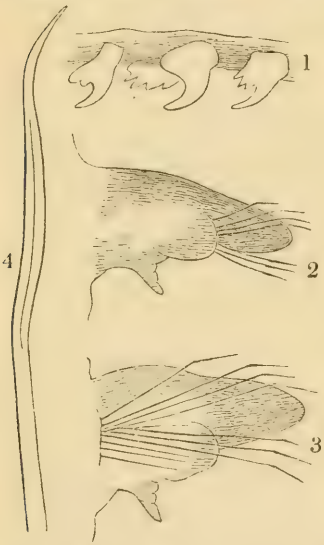
form of an obtuse lobe, without antennæ or with rudimentary tubercle-like antennæ: eyes two or none: mouth with eight jaws in opposed pairs, supported on a double stalk: feet small, uniramous, with simple setaceous bristles in a divided fascicle: cirri none.

1. **L. tricolor**, head semiovate, entire, without any appendage; the first two segments apodous; feet all similar, the upper lobe conoid, prolonged beyond the obtuse setigerous lobe, which has a curved process at its base; bristles bifasciculate; a tuft of very short bristles at the base of the foot. Length 10″; breadth 3‴.

Nereis tricolor, *Mus. Leach.*

Hab. South Devon, *G. Montagu.*

Desc. Lumbriciform, equally convex on both surfaces, narrowed towards the extremities, smooth and iridescent, with brilliant blue reflexions in the sutures. Head a semiovate entire lobe without any



No. XXII.—*Lumbrineris tricolor.*

1. Three of the upper jaws.
2. The foot.
3. The foot slightly compressed, to show the superior fascicle of bristles.
4. Bristle magnified.

appendage, smooth, projecting forwards over the mouth, the line behind straight or a little sinuated, where there are two dark spots obscurely marked, which may be eyes. Mouth inferior, armed with a series of black jaws (No. XXII. fig. 1) which are very coarsely dentate on the edge, and each pair differently from the others. First and second segments apodous, nearly equal. Segments numerous, all alike, narrow, the sutures impressed, smooth. Feet (figs. 2 & 3) forming a narrow neat edge along the sides, uniramous, bilobed, the upper lobe obtusely conical, elongated, and produced far beyond the setigerous lobe, which is rounded, with a curved process at its base. Bristles (fig. 4) in two fascicles, colourless or straw-yellow, simple,

setaceous. The superior or terminal fascicle has its bristles separated into two sets, but the bristles in both are alike and few in number; they are long and somewhat flexible, the shaft cylindrical, bent or kneed above the middle, whence it tapers to an acute point, and has a pellucid edge along one side; perhaps the point is concave, and this edge may be a deception from the high magnifiers used. The inferior or basal fascicle consists of very short straight setaceous bristles laid parallel to each other. Anal segment without styles.

One specimen in the Museum Collection is 11 inches in length, and as thick as a large quill; it is of a uniform dark yellowish colour. Two other specimens, about half the size, are of a uniform greyish colour;—differences dependent undoubtedly on the action of the preservative fluid. There is no appearance to explain the origin of the specific name,—derived no doubt from the living animal.

The species is nearly allied to the *L. Latreilli* of Audouin and M.-Edwards, but there are no clavate bristles in the feet of the hinder segments. Perhaps it is even more nearly allied to the *Œnone maculata* of Edwards, in Cuv. Règn. Anim. Illustr. pl. 11. f. 4. There is an exact resemblance in the form of the head, and, so far as I can judge, in the jaws; but the *L. tricolor* differs in its markings, in being thicker in proportion to its length, and in having a lobe underneath the foot.

(*a*) South Devon, *G. Montagu*.

(*b*) South Devon, *J. Cranch*.

Fam. IV. NEREIDÆ*.

Nereis, *Linn. Syst. Nat.* x. 654, xii. 1085.

Nereides (—), *Lam. An. s. Vert.* v. 310. *Johnston in Ann. Nat. Hist.* iii. 289.

Nereides Lycoriennes, *Savig. Syst. Annel.* 12.

Nereidea (—), *Blainv. in Dict.* lvii. 464.

Nereidæa (—), *Latr. Fam. Nat.* 240.

Nereidiens (—), *Aud. & M.-Edw. Litt. de la France*, ii. 179.

Nereidæ, *Williams, Rep. Brit. Assoc.* 1851, 187.

Nereideæ, *Oersted, Annul. Dan. Consp.* 17.

Lycoridea, *Grube, Fam. Annel.* 46.

Char. Body scolopendriform, with numerous segments, varying in number from age: head distinct, subquadrangular, with two pairs

* "And after these the sea-nymphs marched all,
All goodly damzels, deckt with long greene haire,
Whom of their sire Nereïdes men call:—

* * * * * *

All these the daughters of old Nereus were,
Which have the sea in charge to them assinde,
To rule his tides, and surges to uprere,
To bring forth stormes, or fast them to upbinde,
And sailers save from wreckes of wrathfull winde."—Spenser.

of eyes on the vertex: antennæ two, median, supported by two large biarticulate palpi: proboscis biarticulate, with two jaws: tentacular cirri four on each side in unequal pairs: feet well developed, lobulated, with a dorsal and ventral setaceous cirrus; two of the lobes armed each with one spine, and with a bifasciculate brush of compound bristles, the terminal piece acicular in most, but in many of the lower brush falcate: anal segment with two setaceous styles.

The name *Nereis* was imposed by Linnæus on a group of Annelides which had an elongated vermiform body furnished with soft well-developed appendages, and a head, eyes, and tentacula*. The characters of the group were modified by Pallas and Müller; and Cuvier made them more precise and restrictive, by which the Eunicæ were separated from it. Savigny, in adopting these as separate families, gave to their peculiar distinctions a still more precise definition.

Blainville, on the contrary, reunited the families Nereides and Eunices, and under the former name embraced a large number of genera. These were divided into four tribes upon arbitrary principles and distinctions, and the consequence is, that we find genera which are much alike placed far asunder, while others no way nearly allied are forced into almost juxtaposition. Even species of the same genus are made members of different tribes.

Audouin and M.-Edwards have followed much the same method as Savigny, separating, however, from the Nereides some annelidans whose structure seems to be too diverse. They retain in the family all the Nereids of Savigny which have a distinct head, a large proboscis generally armed with jaws, and a very considerable complexity of exterior organization.

The body of the Nereides is always slender, linear, and more or less cylindrical. The number of constituent rings is in general very considerable; and, with a few exceptions, the rings which follow the head are the largest, diminishing almost insensibly as they proceed to the tail. Sometimes the body is narrowed towards both extremities. The head is commonly of easy detection and indisputably defined, but very variable in form. It is rarely without tentacula and antennæ; and eyes are placed on its dorsal aspect. The proboscis is a powerful organ, in general divisible into a basal and terminal portion, and almost always armed with horny falcate cutting jaws, denticulated like a saw along the inner margin. But in some species the proboscis has no maxillæ; and yet this annelid may be a member of a genus whose species are generally so furnished.

In the great majority of the Nereides there are on each side of the

* The last definition Linnæus gave to *Nereis* is—"Corpus repens, oblongum, lineare. Tentaculis lateralibus penicillatis. Os terminale unguiculatum. Tentaculis plumosis supra os."—Syst. p. 1085. This is less true than the previous definition:—"Corpus oblongum, lineare, segmentis annularibus. Tentacula lateralia ad singulum segmentum utrinque solitaria. Os terminale unguibus duobus arcuatis oppositis."—Syst. edit. 10. p. 654.

head a certain number of tentacula, more or less developed, and similar in structure to the superior cirrus of the foot.

The feet form a protuberant series of setigerous lobules along each side; and they do not differ essentially, although the appendages may be more developed on a certain number than on others. In general each foot is divided into two distinct branches. The bristles with which they are armed are mostly compound; and to each brush of them there is a spine of the usual form. The cirri are usually filiform or subulate, but in some genera they are transformed into compressed laminæ or leaflets. The branchiæ are simple in structure. Their existence is sometimes doubtful, but more generally they are detected in the guise of lobules or tonguelets on the feet, distinguished from the feet's proper lobes by being destitute of bristles or any armature.

Synopsis of Genera.

11. **Nereis.** Feet homologous.

12. **Nereilepas.** Feet nearly homologous; the hinder ones most developed.

13. **Heteronereis.** Feet dissimilar; the hinder ones with foliaceous lamellæ.

11. NEREIS.

Nereis (—), *Cuv. Règn. Anim.* iii. 201. *Aud. & M.-Edw. Litt. de la France*, ii. 184. *Johnston in Ann. Nat. Hist.* iii. 289, and v. 168. *Williams in Rep. Brit. Assoc.* 1851, 197, 211, 231, *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 401.
Lycoris (—), *Lam. An. s. Vert.* v. 311. *Savign. Syst. Annel.* 29.
Nereis, *Oersted, Annul. Dan. Consp.* 21; *Grœnl. Annul. Dorsibr.* 22.

Char. Segments all similar in form, with nearly similar feet; the dorsal cirrus without a mammillate lobe at its base, and no lobule beneath the ventral cirrus: no branchial laminæ on the feet: terminal piece of the bristles acicular in the upper brush, and acicular and falcate in the lower brush.

The body of the Nereis is always vermiform, insensibly tapered towards the tail, somewhat truncate in front, and composed of numerous narrow segments. The back roundish, but the ventral surface is flattened, and marked down the middle with an impressed line. The head is distinct, a little contracted in front, and furnished with two pairs of eyes placed on the occiput, the one before the other. The small subulate antennæ are inserted on its frontal margin (Pl. XV. fig. 1 *a*, *a*); and, in general, we find two of these organs, which are guarded on each side by a thick palpus distinctly formed of two articulations, the apical capable of being retracted within the other (fig. 1 *a*, *p*). The large cylindrical exsertile proboscis is divided

into two rings, and its surface is roughened with minute corneous prickles, more or less numerous in the various species, and distributed in annular rows or limited patches: the orifice is destitute of tentacula, but armed with two powerful jaws curved like a sithe, and serrulated on the inner margin (fig. 1 *a, pr*). The first segment of the body (fig. cit. *s*) is often larger than the following; and from its anterior margin four pairs of tentacular cirri arise (*t*), which spread out on each side of the head in the form of tapered filaments. The feet are homologous throughout and protuberant, formed of two branches coalescent at their insertion with the trunk; and each branch is furnished with a spine, or sometimes with two or three spines, and one or two bundles of bristles (fig. 1 *b*): the latter are two-jointed, the basilar portion being thickened towards its extremity, which is deeply cleft to receive the terminal piece into a sort of socket (fig. 1 *c*): this piece is sometimes long, straight and subulate, at other times short, flattish, and slightly curved. The cirri are always slender and tapered; we find one at the base of each branch of the foot, and that of the ventral branch is invariably shorter than the one pertaining to the dorsal (fig. 1 *b, c*). The branchiæ, according to Savigny, are constituent parts of the feet, consisting of three fleshy papillæ which occupy their extremity (fig. 1 *b, b*). Two of these lobe-like appendages are fixed to the dorsal branch, one under the superior cirrus, and one under the setigerous tubercle; and the third is situated under the ventral branch, between the setigerous tubercle and inferior cirrus. The form of these papillæ, as well as their relative size, often varies on the different parts of the body, but they are found on all the feet, excepting, sometimes, on the second and third pairs, where they are more or less rudimentary. Audouin and Milne-Edwards deny their branchial character, since they are not more vascular than the other lobules of the foot; but at the base of these organs there is a vascular network, which appears to the naturalists mentioned to be the principal seat of respiration. The anal segment is always terminated with two styles.

As of most natural and typical genera in every class of animals and of plants, the species appear to be numerous, and to resemble each other so closely, that it is not, in some instances, easy to decide what should constitute their permanent diagnostics; or to express, in a few apt words, the minute shades of difference in certain organs which seem to mark them as distinct species. I am satisfied that, in this genus, the *form* of the body of specimens preserved in spirits will afford no specific character; and that as little reliance can be placed on *colour*, although this is perhaps more uniformly alike in living individuals. The *number of segments* is also, as Otho Fabricius long ago remarked*, liable to considerable variation, both from

* "Ceterum numeravi sine respectu magnitudinis segmenta 56, 65, 76, 78, 86 in diversis; igitur de numero nil certi statui posse patet: hunc characterem etiam quam maxime vacillare facile credat, cui mutilatio et redintegratio articulorum innotuit; sub reintegrando enim articulo caudali primum accrescente, reliquis vero successive, a momento conspectus numerus dependet."—Faun. Grœnl. p. 292. "I

age and from mutilation; for if the posterior segments have been lost by accident, they are indeed again renewed, but not in their original numbers or size; and moreover it is often very difficult to count the segments from the minuteness and crowding of the posterior ones. The pattern after which the prickles of the proboscis are arranged varies in some species, but it is almost impossible to define those variations in words, and the character fails us in the nearest allied species, where only it is required*. Such is also the case with the number of serratures along the falcate edge of the jaws, though the character is one not to be neglected; but from the peculiar shape of the jaw, I have sometimes found a difficulty in determining the exact number of these serratures; and, in other instances, have had a doubt whether one or two of them, from their obsoleteness, ought to be reckoned. I place little value on any differences in the shape of the head, or in the proportions between the palpi and antennæ; but a specific character, it appears to me, may be justly founded on differences (1) in the proportion of the first or post-occipital segment to the second; (2) in the comparative lengths of the longest pair of tentacular cirri; but (3) principally in the variety exhibited by the lobes and appendages of the feet. Every foot, let it be remembered, consists of a superior and an inferior cirrus, three papillæ presumed to be branchial, and two tubercles armed with compound bristles, — the superior tubercle being always situated between the dorsal and second papillæ, and the inferior tubercle between this and the ventral papillæ. On these particulars I will endeavour to define the British species before me; and I trust that, with the designs which illustrate the specific characters, the student will now be able to determine, with comparative ease and certainty, such of them as he may meet with in his researches.

1. **N. brevimana**, post-occipital segment not much longer than the second, the tentacular cirri once and a half or twice the length of its diameter; feet with subequal parallel lobes, the inferior connate, with the setigerous branch on the posterior feet; terminal piece of the bristles smooth; cirri very short, not reaching the apex of their lobes; jaws with eight denticulations. Length 3″.

Nereis brevimana, *Johnston in Ann. Nat. Hist.* v. 170 (1840).
Nereis Sarsii, *Rathke in Nov. Act. Curios. Cæsar.* xx. 161 (1843) tab. 8. f. 6–8.

Hab. The littoral region.

Desc. About 3 inches long, and about the size of an earthworm

have purposely abstained from specifying the number of segments as a leading feature. It appears to me, in as far as hitherto determined, that a frequent, if not a continual, evolution of new articulations is advancing, so as to preclude calculation of any precise number as belonging to a species."—Sir J. G. Dalyell, Pow. Creat. ii. p. 163.

* Blainville believes that these prickles will afford the best specific character. —Dict. des Sc. nat. lvii. 472.

of the same length. Head narrow. Eyes very distinct. Antennæ not projecting beyond the palpi. Proboscis roughened as usual with black horny spinules. Jaws of a light horn-colour, pellucid, with eight triangular stout teeth not reaching to the point, which is plain.

No. XXIII.—*Nereis brevimana.*

Tentacular cirri unequal, the longest setaceous, in length fully twice that of the diameter of the segment. Rings about 88, narrowed posteriorly, the anal one terminated with rather long styles. The inferior branchial lobe becomes smaller as we trace the feet backwards, and near the middle of the body forms almost a part of the setigerous tubercle (fig. *m*), the union being still more complete on the posterior pairs of feet, on which also there is a mere vestige of the ventral cirrus (fig. *p*). The colour of some of the specimens in spirits becomes a wax-yellow, with a tinge of brown, and a dusky line across the margin of the segments.

This species very closely resembles *Nereis pulsatoria*, but in the latter the jaws are serrated to the apex, and the terminal joint of the bristles is finely serrulated along one edge. The specific character of Rathke is very applicable.

Obs. About 3 inches long, and larger than an earthworm of the same length. The colour is discharged from specimens preserved in spirits, and I have not seen a living specimen.

(*a*) Plymouth.

(*b*) Ayrshire, *P. W. Maclagan, M.D.*

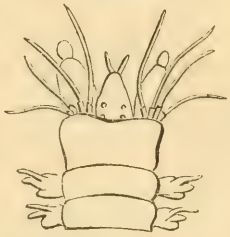
2. **N. pelagica**, post-occipital segment about twice as long as the second; tentacular cirri longer than its transverse diameter; jaws with ten obtuse denticulations; lobes of the feet papillary, obtuse, subequal, the dorsal more or less humped; superior cirrus twice as long as its lobe; terminal piece of the bristles smooth. Length 8″.

Nereis pelagica, *Linn. Syst.* x. 654; xii. 1086; *Faun. Suec.* 2nd edit. 508. *Bast. Opusc. Subs.* ii. 133. tab. 6. f. 6, cop. in *Encyclop. Méth. Vers*, pl. 55. f. 21–23. *Johnston in Ann. Nat. Hist.* v. 172. f. 3, 4. *Oersted, Ann. Dan. Consp.* 21. tab. 4. f. 72, 75 & 76; *Grœnl. Annul. Dorsibr.* 23. f. 52, 53.

Hab. The littoral region; and ascends tidal rivers as far as the water continues brackish.

Desc. Body from 4 to 6, or, when fully extended, even 8 inches in length, semicylindrical, of the thickness of a goose-quill, tapered towards the tail, of a brown or flesh colour more or less lustrous, with metallic or olive-green reflexions, particularly near the head, and on the anterior margins or sides of the rings. Head triangulate (No. XXIV.), obtusely pointed in front. Eyes four. The superior tentacular cirri reach to the margin of the fourth ring, and are longer by a third than the second pair, which again are nearly twice the length of the inferior pairs. Mouth with a large proboscis armed with two strong jaws, around which are placed, on as many swellings, six distinct patches of small black prickles, the side patches larger than the others; two still smaller patches are situated just under the projecting lobe of the head, while at the very base of the proboscis we find a band of similar prickles, some larger than others, arranged in several irregular series. Jaws falcate, dark brown except at the base, with ten serratures. First ring twice as large as the following, scored with faint whitish lines or sometimes spotted; and oblique

No. XXIV.
Nereis pelagica.



No. XXV.—*Nereis pelagica.*

lines of the same kind may be seen, with a magnifier, on the sides of the other segments, of which, in a large specimen, there were 123, smooth, excepting that across the front margin of a few of the anterior segments a line of minute granules is very often visible. Feet (No. XXV.) nearly all alike, the cirri short, the terminal or branchial lobules conical, nearly equal on the anterior feet, but towards the middle of the body the superior becomes larger and more prominent than either of the others; setigerous tubercles small, the bristles of the superior fewer and more slender than those of the inferior, all of them two-jointed, the terminal piece obliquely set, setaceous, smooth, liable to be broken off; the bristles are as usual acicular and falcate. Spines one to each bundle of bristles, acute, dark brown. Anal segment white, and terminated with two short styles.

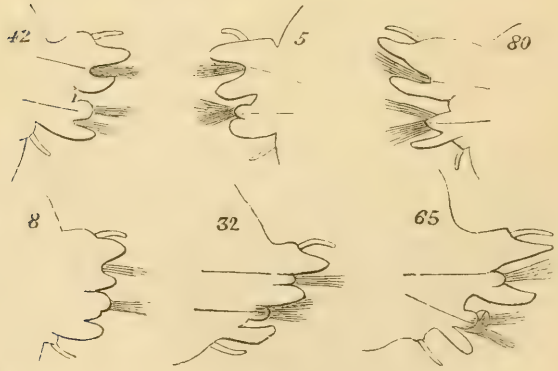
Obs. This is the commonest species of its genus. It is always more or less tinged with green, on the front especially; and the red vessel that runs down the dorso-medial line is always very conspicuous. The proboscis is a beautifully armed organ; the basal half is encircled with numerous prickles in several irregular series, and

there are four prickles in each cluster of its dorsal mammillæ; the anterior half has four many-prickled clusters in front, of an oblong form; three prickles in a line on a mesial lobe behind; and opposite, on the oral side, a cluster of several small prickles. The jaws have ten obtuse denticulations; but as those on the lower half are not protuberant beyond the edge, it is not easy to ascertain the exact number.

I have seen specimens which were of a uniform grass-green colour, tinted only with fuscous-brown about the head. At some seasons of the year, in autumn especially, the body is often blotched with large irregular yellow patches, and traversed with red lines, occasioned by the viscera appearing through the skin. A red vessel may be always traced down the middle of the back, giving off, to each foot, a small branch, which is again slightly ramified; and a similar vessel runs along the flat ventral surface, which is marked with a median furrow. But after being macerated in spirits (to which it communicates a green colour), the colours entirely disappear, the worm becoming of a uniform dead yellowish white, with a pearly gloss, most distinct on the belly, and a tinge of brown sometimes remains on the back. When allowed to die gradually in sea-water, the animal often pushes forth its well-armed proboscis, which is marked with pale anastomosing lines in a longitudinal direction, probably of a muscular character. In dying it relaxes considerably. Fresh water is an immediate poison to such individuals as are taken from the sea-shores; yet a partial mixture is not unfavourable to its habits, for the species is to be found abundantly burrowing, like an earthworm, in mud in the brackish water of our tide-ways and littoral marshes.

To show how far the feet of the same species may vary, I have

No. XXVI.—*Nereis pelagica.*



given the above figures (No. XXVI.),—the three upper ones taken from an individual immediately after being killed by immersion in spirits,—the three lower ones from a specimen that had been preserved for some years. It would have been easy to have multi-

plied figures exhibiting still other dissimilitudes, but the pattern, though modified, is always essentially the same. Some of these differences proceed from selecting feet of non-corresponding segments; others are produced by differences in the condition of the worm when killed,—for example, from its being filled with ova or not; and others again from a difference in the strength of the spirits in which the specimens are placed. In some specimens which had been long preserved, the post-occipital segment was scarcely larger than the one behind; but when alive, the great proportional size of the former is always very obvious.

I cannot refer *N. pelagica* to any of the species described by Audouin and Milne-Edwards. From their description and figure of *N. Beaucoudrayi*, it is evidently nearly allied; but *N. Beaucoudrayi* differs in having only 100 segments, while it is equal or superior in size; in the first ring not being larger than the following; and in the greater elongation of the tentacular cirri.

(*a*) Bell Rock, Scotland, *Dr. Leach.*
(*b*) Devonshire Coast, *Dr. Leach.*
(*c*) Holy Island, *Dr. Johnston.*
(*d*) Holy Island, *Dr. Johnston.*
(*e*) Holy Island, *Dr. Johnston.*

PLATE XV. Fig. 1. *Nereis pelagica* of the natural size. 1 *a*. The head and proboscis magnified (see also p. 145). 1 *b*. A lateral view of a foot. 1 *c*. Two bristles. 2. The young? of *N. pelagica*.

The changes which the Annelides pass through, from the egg state to their maturity, have not been traced by any one*, and the general belief appears to be that none of the class undergoes any metamorphosis, proceeding from the egg with all the characters and lineaments of the parents. I have no direct observation to oppose to this belief, which, however, I have been led to think is questionable. In Pl. XV. fig. 2 represents what seems to me to be the young of a *Nereis*, probably of *N. pelagica*, and the differences between it and the adult are not inconsiderable†. The tentacula and tentacular cirri, it will be observed, are wanting, while the head is large

* The evolution of the egg in the Annelides has been very carefully traced by De Quatrefages, and the various phases of it admirably described in his "Mémoire sur l'Embryogénie des Annelides" in the Annales des Sciences naturelles for 1848, vol. x. p. 153, &c. In vol. viii. p. 99 of the same excellent journal, there is an interesting "Note sur l'Embryogénie des Annelides" by the same author; see also tom. iii. p. 142 (1845). But these essays are certainly not superior in interest to M. Milne-Edwards's "Observations sur le Développement des Annelides" in tom. iii. p. 145 (1845). This is written in Edwards's usual style,—characterized by elegance, copiousness, and ease.

† From the discoveries of M.-Edwards, it seems likely that I am wrong in this conclusion. The larva of a nearly allied species does not exhibit the lobes at the sides of the head, &c. See the figures of M. Edwards in Ann. des Sc. nat. iii. pl. 10 & 11 (1845). See also Williams, Rep. Brit. Assoc. p. 166; Quatrefages, Souvenirs, ii. p. 45; Ray Soc. Rep. 1845; Peach in Ann. & Mag. Nat. Hist. ser. 2. viii. p. 500. pl. 17. figs. 5, 6.

Does Peach's worm belong to the genus *Dujardinea*? See Ann. & Mag. Nat. Hist. xiv. pp. 32, 33.

and well developed; and there is a pair of large clavate organs at its junction with the first segment, by the aid of which the little creature appears to move through the water, for in this stage of its life it is an excellent swimmer as well as a swift creeper. There is a prominence at the base of each, perhaps the buds of future tentacular cirri; and here we observe underneath some minute ciliated organ, by whose play a current of water is driven violently along the sides. By the play of other ciliated organs at the tail, similar currents are there created and kept up; and the whole process forcibly recalls to memory the mechanism by which respiration is carried on in many of the edriophthalmous Crustacea. The eyes are in a straight line, and not less distinct than in the adult. The feet are well developed, biramous; the caudal segment rounded, of a dark colour, and ciliated all round. I found these supposed young in the beginning of September amongst Confervæ; they were about two lines in length, and very active.

The luminous animalcule sometimes to be seen on the shells of oysters, and delineated by Baker (Employm. for the Micros. p. 399, pl. 15 A), seems to be the same worm, a little further advanced. The tentacula are now developed, as well as a single pair of the tentacular cirri. "This little insect," says Baker, "can emit or conceal its light; and sometimes its lustre is so bright as to be discoverable even in open daylight, especially on being touched or disturbed. Its light is bluish like that of the glow-worm, or a spark of burning brimstone."

Quatrefages has been led, from the microscopic study of the small transparent Annelides, "to infer that its production depends very intimately upon the influence exerted by the nervous system in giving rise to muscular contraction."—*Ann. & Mag. Nat. Hist.* xiv. 34. See Ray Soc. Rep. Zool. 1847, 504.

3. **N. diversicolor**, post-occipital segment twice as long as the second, the tentacular cirri once and a half as long as its breadth; feet with subequal conoid parallel lobes, the dorsal somewhat humped, most so on the posterior feet; upper setigerous branch obsolete; terminal piece of the bristles smooth; dorsal cirrus scarcely reaching beyond the apex of its lobe; jaws with ten denticulations. Length 4–8″.

Die bunte Nereide, *Müll. Wurm.* 104. tab. 6.
Nereis diversicolor, *Müll. Zool. Dan. Prod.* 217. no. 2624. *Fabric. Faun. Grœnl.* 291. *Oersted, Annul. Dan. Consp.* 23. pl. 4. f. 66, 68 & 73; *Grœnl. Annul. Dorsibr.* 24; *and in Kroyer's Naturh. Tids.* 118.
Nereis versicolor, *Turt. Gmel.* iv. 86.
Lycoris margaritacea!, *Leach in Mus. Johnston in Zool. Journ.* iv. 420; *and in Loud. Mag. Nat. Hist.* vii. 230.
Lycoris viridis, *Johnston in Zool. Journ.* iv. 419.
Nereis pelagica, *Johnston in Ann. Nat. Hist.* iii. 290. pl. 6. f. 1.
Nereis viridis, *Johnston in Ann. Nat. Hist.* v. 171.

? Heteronereis fuscicola, *Oersted, Grœnl. Annul. Dorsibr.* 28. tab. 1. f. 17; tab. 3. f. 55, 58 & 59; *and in Kroyer's Naturh. Tids.* 115 (1842). *H. Rathke in Nov. Act. Cæsar. Curios.* xx. 158 (1843), tab. 8. f. 1–3.

Nereis verrucosa, *Müll. Zool. Dan. Prod.* 217. *Fabric. Faun. Grœnl.* 292.

Nereis fulgens, *Dalyell, Pow. Creat.* ii. 153. pl. 22. f. 6–8.

Hab. The Laminarian region. Ayrshire, *Dr. P. W. Maclagan.* On the coast of the Isle of Man; Orkney and Shetland, *Edward Forbes.* Coast of Ireland, *W. Thompson.* "This is a littoral Nereis: it retreats from the light, lurking under stones, or in the clefts of the rocks, near low water, where always moist."—*Dalyell.*

Desc. This species sometimes attains a length of 8 inches, with a thickness equal to that of a swan's quill. It is thicker in proportion to its length than *N. pelagica*, and has the organs of the head more developed. The proboscis of both species is almost exactly alike armed, but the serratures of the jaws in *N. pelagica* do not reach the points, which are rather obtuse. The number of serratures on the jaws appears to be more than ten, but not more than six of them form prominent denticles on the edge. The segments vary from eighty to ninety, and are marked with a few oblique striæ on each side above the feet, which are well developed. The dorsal branchial lobe is rather larger than the others, and somewhat humped; and from the front of the hump originates the cirrus, of nearly double its length. The inferior cirrus almost reaches to the tip of its lobe. The bristles are smooth.

The greater number of specimens preserved in spirits are of a uniform pearly iridescent colour, with a slight tinge of brown or pink; but some specimens are of a dusky brown, with glossy reflexions.

"This creature constructs a very thin transparent silky tube, from a matter exuding apparently from the whole body. Here it rests, exposing the head, which commonly waves from side to side. The tube is strengthened by the incorporation of sand where accessible. When otherwise, it remains quite transparent, and it is framed of sufficient width to admit of the animal's reversing itself within. Sometimes the quantity of the secreted matter employed in the covering is copious."—*Dalyell.*

The figure we have quoted from the 'Encyclop. Méth.' undoubtedly represents *N. pelagica*. Hence it follows that this is synonymous with *Nereis verrucosa* of Müller and Otho Fabricius. That it is the *Nereis pelagica* of Linnæus is not so certain, for his specific character—"N. segmentis XL subtus sulcata"—is at variance with fact. As, however, I can scarcely consent that any of our great master's species should be deleted from the "Systema," I willingly appropriate the name to the one before us; (1) because such was the opinion of Müller and Fabricius; (2) because Linnæus quotes as a probable representation of his species the figure of a worm in Baxter, which has seventy segments and upwards; and (3) because it is very probable that there is not existing a species of *Nereis* with so few as forty segments.

I have also scarcely a doubt of this being the *Nereis margaritacea* of Leach (Supp. Encycl. Brit. i. p. 451. pl. 26), but Dr. Leach's character of the species is entirely generical; and Savigny and M.-Edwards and Audouin have particularly described a *Nereis margaritacea*, which is not the same with the one before us, but more nearly related to *N. pelagica*. Neither has this any relation to the *Nereis margaritacea* of the 'Annals,' vol. iii. p. 294, which belongs to a different section of the genus.

Obs. Very similar to the preceding, from which I can only distinguish it by the greater length of the dorsal cirrus. Sir J. G. Dalyell says:—"Colour of the body universally orpiment orange-reddish; a darker longitudinal line, composed of so many short lines, one on each segment down the back. Belly lighter. The whole surface is finely iridescent, reflecting the prismatic colours, whence it may be conjectured that this is the *Nereis versicolor* of nomenclators. I have never seen any specimens, of many taken in Scotland, with a tinge of green."

(*a*) Scotland, *Lieut. Thomas, R.N.*
(*b*) An Irish specimen?
(*c*) Berwick Bay, *Dr. Johnston.*
(*d*) No locality.
(*e*) Wick, Caithness, *C. W. Peach.*

4. **N. cærulea**, jaws with five obtuse denticulations; tentacular cirri rather long, the superior reaching to about the sixth segment; post-occipital segment once and a half as long as the second; feet with the lobes oblique, the dorsal largest and longest, with a swollen base, and its cirrus reaching the apex; upper setigerous branch obsolete, the inferior oblong, prominent; terminal piece of the bristles smooth; inferior cirrus inserted behind its lobe. Length 3–4″; breadth 3–4‴.

Nereis cærulea, *Linn. Syst.* 1086; *Mus. Adolph. Freder.* i. 93. *Penn. Brit. Zool.* iv. 47. pl. 25. f. 32, 33; and edit. 1812, iv. 93. pl. 27, fig. sup. *Turt. Gmel.* iv. 88; *Brit. Faun.* 135. *Stew. Elem.* i. 390.
Nereis margarita, *Montagu in Linn. Trans.* vii. 82. *Turt. Brit. Faun.* 135. *Penn. Brit. Zool.* edit. 1812, iv. 94.
Lycoris margaritacea, *Savign. Syst. Annel.* 33. *Lam. An. s. Vert.* v. 312; 2nde édit. v. 550. *Stark, Elem.* ii. 139.
Nereis margaritacea, *Leach in Supp. Encyclop. Brit.* i. 451. pl. 26. *Grube, Fam. Annel.* 48. *Audouin & M.-Edw. in Ann. des Sc. nat.* xxviii. 277; *and in Litt. de la France*, ii. 195. *Williams, Rep. Brit. Assoc.* 1851, 187, 211 & 231.

Hab. The littoral region.

Obs. The body is more compressed than any of the preceding species, narrowed posteriorly, greenish or greyish-blue, iridescent, with numerous equal narrow segments; the ventral surface yellowish-brown, as are also the feet, which project considerably. The dorsal cirrus reaches the apex of the dorsal lobe, but does not project beyond it. The anal segment is small, cylindrical, with long slender

styles. The proboscis is encircled at the base with two irregular series of dark prickles, and in front there is a solitary one, on each side, placed on a swollen part, with a group of three small prickles in the intervening concave space. The second segment has six clusters of these prickles around the mouth, but in the dorsal cluster there are two prickles only. The jaws have five very obtuse denticulations, with a plain curved apex.

From great unwillingness to delete the nomenclature of our older authors, and because Leach appears to have had no precise idea of his *N. margaritacea*, and the name has been variously applied, I gladly venture to affix to this species a Linnæan name, more appropriate than Leach's, and which nothing in the Linnæan description contra-indicates.

(*a*) Falmouth.
(*b*) Falmouth.

5. **N. fimbriata**, jaws with ten denticles; post-occipital segment twice as long as the second, and the tentacular cirri longer than its diameter; lobes of the feet acute, divaricate, the dorsal short and small, with an elongated cirrus; setigerous lobes lanceolate; the terminal piece of the bristles smooth; inferior cirrus almost reaching the apex of the ventral lobe. Length 3″.

Die faserige Nereide, *Müll. Wurm.* 144. tab. 8, copied in *Encyclop. Méth. Vers*, pl.
Nereis fimbriata, *Müll. Zool. Dan. Prod.* 217. *Turt. Gmel.* iv. 86.
Nereis subulicola, *Leach, MSS. Brit. Mus. Coll.*

Hab. The coralline region.

Desc. This is our smallest Nereis. No specimen exceeding three inches in length has occurred to me in Berwick Bay. It is distinguished by its yellowish-white colour (when alive) with a strong pearly lustre, and by its prominent feet armed with black spines, which are quite visible in their sheaths. The head is streaked, more or less, with brown on the sides; and the anterior portion of the body is tinted with the same colour. The eyes are large and approximate. The jaws have ten obtuse denticulations, and the dark falcate point is plain. The tentacular cirri are well developed. The segments are all alike. The lobes of the feet are acute (No. XXVII.), and the dorsal is small and greatly overreached by its cirrus; the setigerous lobules larger, lanceolate or cordato-acute; the inferior cirrus attaining the apex of its lobe. The bristles present no peculiarity. The anal segment is small, rounded, with long styles.

No. XXVII.—*Nereis fimbriata.*

Obs. This is a common species. It seeks concealment and shelter in the tubes of other worms attached

to old shells; and I often find small specimens under the coriaceous base of *Lobularia digitata*. A comparison of living individuals with Müller's figure left no doubt of their identity with his species. The globule in Müller's figure, which has been mistaken for a "gland," is an egg forced into the position it occupies by slight pressure or, naturally, from over-distension. In examining specimens in May, I found the body literally crammed with ova; and in some, one or more feet were quite distorted by the ova having obtained access within the lobes.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Bexhill, *Brit. Mus.*
(*c*) From an oyster shell, London market, *E. Doubleday.*
(*d*) Falmouth.

6. **N. imbecillis**, jaws slender, edentulous; tentacular cirri not longer than the diameter of the post-occipital segment, which is larger than the second; feet oblique, with conical obtuse lobes, the dorsal twice as large as the others, with its cirrus prolonged beyond the apex; terminal piece of the bristles smooth. Length 4″.

Nereis imbecillis, *Grube, Actin.* 76; *Fam. Annel.* 48.

Hab. The littoral region?

Obs. Readily distinguished by the character of its oral organs, for the edentulous condition of the jaws is accompanied with a similar deficiency of armature in the proboscis. This is unfurnished with prickles, excepting some small light-coloured ones, which are seated in a cluster on the two dorsal mammillæ of the basal segment. The eyes are large and approximate. The segments are nearly equal, narrow, smooth, convex dorsally, and flattened as usual on the ventral surface. The dorsal lobe of the foot is much larger and more protuberant than the others, but similar in shape. The upper setigerous branch is obsolete; the lower papillary. The ventral cirrus is remote in its insertion, and reaches half-way to the apex of the ventral lobe.

The species appears to be similar in form to the *N. cærulea*, but the only specimen in the collection has its lower half in a state of decomposition, and the colour is discharged; it is now a uniform white, with a tinge of rose-red on the back.

(*a*) Sandgate, Kent, *Mus. Leach.*

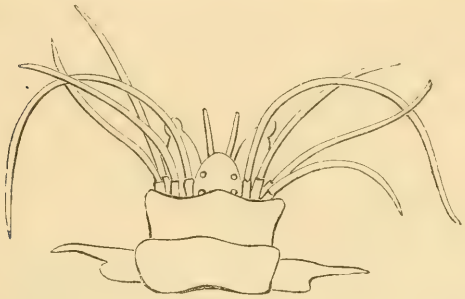
7. **N. Dumerilii**, post-occipital segment rather longer than the second; tentacular cirri three times longer than its breadth; dorsal cirrus projecting considerably beyond the apex of the lobe; lobes oblique, papillary, the upper setigerous, obsolete; jaws with about twelve denticles, extended to the point. Length 4″.

Nereis Dumerilii, *Aud. & M.-Edw. Litt. de la France*, ii. 196. *Johnston in Ann. Nat. Hist.* v. 174. *Rathke in Nov. Act. Cur. Cæsar. Leop.* xx. 163 (1843), tab. 8. f. 4, 5. *Grube, Fam. Annel.* 48.

Hab. The coralline region. Apparently not unfrequent on the Irish coast. Strangford Lough, and elsewhere on the coast of Down, *W. Thompson, Esq.*; Belfast Bay, *Dr. Drummond.*

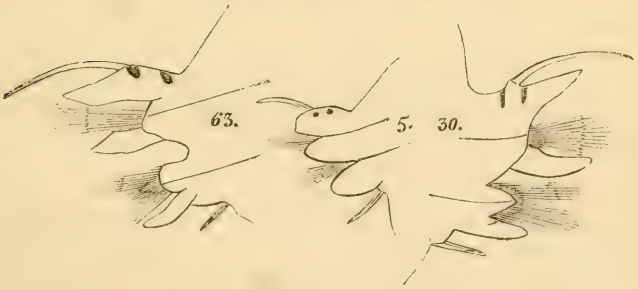
Desc. Body vermiform, flattish or rarely subcylindrical, as thick as a goose-quill, only slightly tapered backwards, smooth, flat on the ventral surface, which has the median line faintly impressed. Head small, armed as usual (No. XXVIII.). Eyes very large. Jaws small, with brown apices, serrated along the edge to the tip or nearly so.

No. XXVIII.—*Nereis Dumerilii.*



Tentacular cirri three times as long as the diameter of the post-occipital segment, which is of about the same length as the next, and rather narrower. Segments about eighty, narrowish, thickened above the origins of the feet, which are well developed, and most crowded on the posterior half of the body. Feet of the anterior segments (No. XXIX. fig. 5) with three short obtuse branchial lobes, the dorsal one more prominent than the others, and the setigerous tubercle minute:

No. XXIX.—*Nereis Dumerilii.*



of the middle and posterior feet (figs. 30 & 63) the branches are widely remote, with the branchial lobes of the superior branch nearly equal, divaricate, and a large brush of bristles between them. The inferior lobe rather small and simple. Superior cirrus twice as long

as its lobe. Inferior cirrus rather short. Spines dark brown. Bristles numerous, pale yellow, smooth and slender.

In spirits the worm is generally of a uniform cream or ochre-yellow colour, with a brown line across the front of every segment, and there are two spots of the same or of a rich yellow colour at the base of the dorsal lobe of every foot. These spots appear to be constantly present, and consequently afford a good character of the species; but they are sometimes less perceptible than is desirable.

(*a*) Berwick Bay, *Dr. Johnston*.

(*b*) Barmouth, Merionethshire, *C. Stokes*.

8. **N. pulsatoria**, post-occipital segment about the same length as the second; tentacular cirri rather short; superior cirrus not reaching beyond the apex of the lobe; terminal piece of the bristles minutely serrulate along one side.

Nereis pulsatoria, *Montagu. Aud. & M.-Edw. Litt. de la France*, ii. 194. pl. 4. f. 8–13. *Grube, Fam. Annel.* 49.
Lycoris pulsatoria, *Savign. Syst. Annel.* 33.

Hab. Shores of the south of England.

Obs. There is no specimen in the collection, nor have I seen one. It appears to be the only species that has the terminal piece of the acicular bristles serrulated. The jaws are represented to be multidentate to the very point.

12. NEREILEPAS.

Nereilepa (—), *Blainv. in Dict. des Sc. nat.* lvii. 469.
Nereilepas, *Oersted, Annul. Dan. Consp.* 20.
Nereis A, *Aud. & M.-Edw. Litt. de la France*, ii. 185.
Nereis B, *Grube, Fam. Annel.* 49.

Char. Head and mouth similarly furnished with *Nereis*: segments alike or nearly so, the posterior with the feet most developed; the dorsal lobe of the foot with a hump or crest above the base, anterior to which the cirrus originates: ventral cirrus remote from its lobe at its insertion: bristles with acicular and falcate terminal pieces.

1. **N. fucata**, jaws multidenticulate, with a plain point; tentacular cirri not longer than the diameter of the head; post-occipital segment a little larger than the second; feet oblique, the dorsal lobe disproportionably larger than the others, more prominent, strongly humped, with its cirrus extending beyond the papillary point; inferior cirrus reaching to or beyond the apex of its lobe. Length 6″; breadth 4–5‴.

Millepeda marina belgica, *Seba, Thesaur.* i. pl. 81. f. 8.

Lycoris fucata, *Savign. Syst. Annel.* 31.
Nereis buccinicola, *Leach, MSS. Brit. Mus.*
Nereis bilineata, *Johnston in Ann. Nat. Hist.* iii. 295. pl. 6. f. 4.
Nereis fucata, *Aud. & M.-Edw. Litt. de la France*, ii. 188. *Grube, Fam. Annel.* 49. *Johnston in Ann. Nat. Hist.* v. 175.

Hab. The Laminarian region. It is generally found in old univalve shells (viz. *Fusus antiquus, Buccinum undatum*, and *Fusus corneus*); and it occupies the shell in common with the Hermit-lobster.

Desc. Body from 3 to 4 inches long, $\frac{2}{10}$ths or $\frac{1}{8}$th broad, semicylindrical, tapered towards the tail, of a tile-red colour, marked along the back with two snow-white lines, the narrow space between them being of a fine dark red colour, glossed with a pearly purple lustre, more especially on the ventral surface. Head small, the front as usual pointed with two conical antennæ longer than its own diameter, and furnished at each side with a large biarticulate palpus. Eyes four, black, and very distinct. Mouth inferior. The proboscis roughened with black prickles. Jaws falcate, rather small and slender, corneous, crenulate on the inner edge; the crenulations four or five, and not deep; the brown curved extremity plain. Tentacular cirri four on each side, setaceous, of unequal lengths. Segments 118, very narrow, the first broader than the following, but not equal in breadth to two united, convex dorsally, smooth. Feet

No. XXX.—*Nereilepas fucata.*

uniform, the superior cirrus elongate, surpassing the dorsal branchial? papilla, which is more prominent and much larger than the others (No. XXX.). Bristles of the upper tubercle few, those of the lower bifasciculate, two-jointed, the apical joint smooth, often broken away from the lowermost bristles. Spines brown, acute; ventral surface flat. Tail with two short styles.

When macerated in spirits, the lines and red colour are completely removed, and the body becomes of a uniform pearl-grey.

I have occasionally found this beautiful species concealed in old univalve shells, brought up, with other rubbish, on the lines of our fishermen; one individual was taken from a shell of *Fusus corneus*, which appeared at first to be fully occupied with a Hermit-lobster.

Obs. The body is plano-convex, narrowed gradually to the tail, and also at the head, the feet forming a fringe on each side fully a

line in breadth, and of a duller colour than the centre with dusky bristles. The proboscis is armed as usual with prickles, but they are smaller than in most true *Nereides*, and the circular series on the basal segment is interrupted towards the dorsal side. In one specimen, 90 segments were counted, in another 120; they are subequal, narrow, smooth, convex dorsally, flat on the ventral surface, and deeply incised. The anal has short styles. The feet are lobulated, the lobes parallel on the anterior segments, but soon attaining their full development, and not altering materially on the posterior portion of the body. The colour of living individuals is tile-red, marked along the back with two snow-white lines; but the lines and red colour are completely removed by maceration in spirits, and the body becomes a uniform pearl-grey, or white with a slight tint of red, or sometimes yellowish-brown. There is usually a dusky spot at the base of the anterior feet; and a dark spot on the tip of the dorsal lobe of the posterior feet, producing a fine effect; but this character does not appear to be constant.

Two species may be confounded in this description; but it would require an examination of living specimens to resolve the doubt I entertain.

(*a*) South Devon, *G. Montagu.*
(*b*) Sandgate, *Rev. Ger. Smith.*
(*c*) Hastings.
(*d*) Berwick Bay, *Dr. Johnston.*
(*e*) No locality.

PLATE XV. Fig. 4. A side view of the foot of *Nereilepas fucata*, from about the middle of the body.

A specimen of a worm, which, I believe, is referable to this species, presents some peculiarities that are owing, probably, to the strength of the spirits in which the individual had been immersed. It is a powerful worm, remarkably rigid, so that the body breaks when it is attempted to be bent, of an ochre-yellow colour without spots, but with a dark line down the centre of the back, marking the course of the blood-vessel. The annuli are very distinct and narrow, all of them furnished with large thick compound feet that project on each side, and form a close-set series of strong compressed lamellæ or oars. The superior branchial lobe is strongly bumped, with a cirrus, which, on the anterior feet only, projects beyond the apex of the lobe; on the middle and posterior feet it just reaches the point, or only slightly exceeds it. The bristles are blackish or dark brown. The anal segment is rounded and apodous, but terminated with two tentacular styles.

A specimen which was softened by long immersion in spirits, was distinguished by having the apices of the lobules of the feet on the posterior half of the body of a dark or black colour. The lobules of the anterior feet were not so distinguished. The colour of the body was pearly on both surfaces. There was a group of spinous granules at the base of the jaws on both dorsal and ventral aspects of the

proboscis; another on an infra-labial swelling: on the inferior ring there were two clusters of these prickles on the dorsal side, and a series encircling the inferior half. The jaws had ten obtuse denticulations about the middle, but both the base and apices were without any. The rings were fully 100; the feet nearly alike.

Taking the form of the foot to be specifical, I refer this to *N. fucata*. I think it remains to be proved that the serratures in the jaws are specific. The superior cirrus was longer than the lobe.

The specimen was found in the shell of *Buccinum undatum*, along with the Hermit-lobster.

13. HETERONEREIS.

Nereilepa (—), *Blainville in Dict.* lvii. 469.
Heteronereis, *Oersted, Annul. Dan. Consp.* 19; *Grœnl. Annul. Dorsibr.* 22, *and in Kroyer's Naturh. Tids.* 1842, 115; *Ray Soc. Rep. Zool.* 1847, 505.
Nereis C, *Grube, Fam. Annel.* 50.

Char. Anterior portion of the body subcylindrical, with simply lobulated feet; the posterior portion flattened, with narrower segments and compound feet, there being attached a foliaceous branchial lamina to the superior setigerous branch, and another beneath the inferior cirrus: dorsal lobe with a hump or crest, the cirrus originating at its base: bristles compound, some with falcate and some with acicular points.

1. **H. lobulata**, lobes of the feet conoid, subequal; the dorsal with its crest rather small and globular; the cirrus smooth, scarcely reaching beyond the apex; lamellæ somewhat reniform, rather small, entire; inferior cirrus with two papillæ at its base. Length 7″; breadth 4‴.

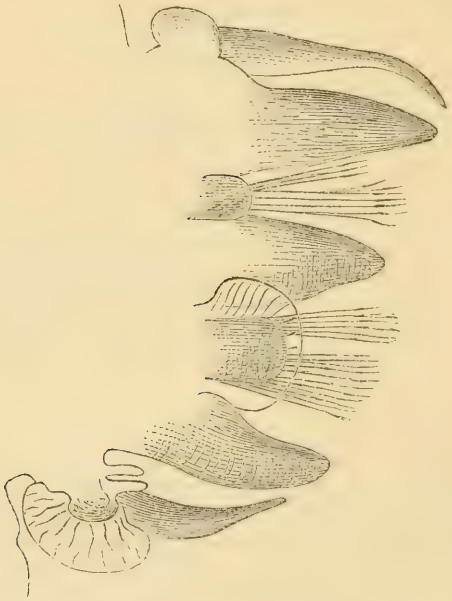
Lycoris lobulata, *Savign. Syst. Annel.* 30. *Lam. Anim. s. Vert.* v. ; 2de édit. v. 549. *Risso, l'Europ. Mérid.* iv. 416?
Nereilepa lobulata, *Blainv. Dict.* lvii. 469.
Nereis lobulata, *Aud. & M.-Edw. Litt. de la France*, ii. 191. pl. 4 A. f. 7, 8. *Grube, Fam. Annel.* 50.
Nereis littoralis, *Leach, MSS. Brit. Mus.*

Hab. The littoral region?

Desc. Body plano-convex, linear, narrowed at the head and posteriorly, of numerous narrow and similar segments. Head transversely oblong, with four large eyes, of which the posterior pair are higher than the anterior. Antennæ nearly as long as the large palpi. Tentacular cirri unequal, one-half longer than the diameter of the body. Proboscis surrounded at the base with a double circle of dark-brown prickles interrupted above, where there are two stronger and solitary ones, with a group of small ones between. Post-occipital segment one-half longer than the second, distinctly sinu-

ated in front. Segments smooth, lined obliquely on the sides, or not lined, and those of the posterior half dimidiate; the anal with setaceous styles. Feet not decidedly dissimilar to the naked eye, those of the anterior segments smaller and lobulate, very soon receiving their full development, when the organ resembles the annexed figure (No. XXXI.) taken from that of the 36th segment. Dorsal lobe conoid,

No. XXXI.—*Heteronereis lobulata.*



with a globular swelling at its base, in front of which the superior cirrus originates, and reaches to or beyond the point of the lobe; upper setigerous branch rather small, retreating; middle lobe conoid like the dorsal, shorter; under setigerous branch larger than the upper, and with more bristles in its fascicle, overlaid with a veined subreniform entire leaf-like branchia; inferior to this another conoid lobe, beneath which is the setaceous inferior cirrus with a pair of small papillæ at its base, and a small reniform entire branchial leaf. Bristles of superior fascicle (*setæ spinosæ*) two-parted, colourless, compound, the shaft cylindrical, cleft at the top, in which is inserted the long needle-like smooth top-piece; bristles of inferior branch bifasciculate, those of the upper brush of two kinds, one like the bristles already described, and the other (*setæ falcatæ*) stouter and shorter, with a cylindrical slightly bent shaft, cut obliquely at the top, where there is articulated a short claw-like piece, smooth, or

with only a minute denticle at its base. Spine one to each branch, very dark brown, with a light base.

The specimen is 7 inches long, 4 lines in diameter; and although the last segment has two styles, it is evidently imperfect. The colour is discharged.

Obs. Has the general form and characters of a *Nereis*. The tentacular cirri are short, about one-half longer than the diameter of the post-occipital segment, which is longer than the second. The terminal pieces of the bristles are smooth.

(*a*) Plymouth, *Mus. Leach.*

(*b*) Falmouth.

2. **H. renalis**, lobes of the feet conoid, oblique, the dorsal with a flattened crest, and a cirrus crenated underneath and far overreaching the apex; lamella of the setigerous branch large and reniform; the inferior small and reniform; inferior cirrus with a curved lobule at its base; jaws with five denticulations. Length 4″.

Nereis renalis, *Johnston in Ann. Nat. Hist.* v. 176 (1840). *Williams in Rep. Brit. Assoc.* 1851, 197. f. 14.

Heteronereis arctica, *Oersted, Grœnl. Annul. Dorsibr.* 27. f. 50*, 51, 60, 65, 68, 70*, *and in Kroyer's Naturh. Tids.* 1842, 117. *Ray Soc. Rep. Zool.* 1845, 281.

Nereis grandifolia, *H. Rathke in Nov. Act. Cæsar. Cur.* xx. 155 (1843), tab. 7. f. 13, 14. *Ray Soc. Rep. Zool.* 1847, 506.

Nereis arctica, *Grube, Fam. Annel.* 50.

Hab. The coralline region.

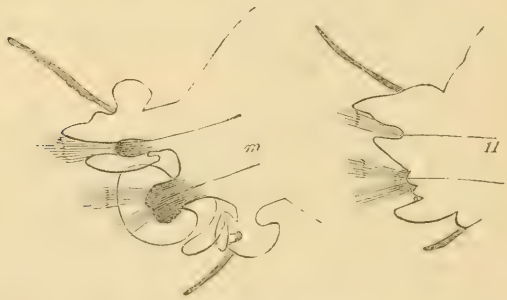
Desc. Body rather flattish, about 4 inches long, very slightly tapered to the tail, which is obtuse and terminated with two short styles. Head distinct, obtusely triangular, pointed in front with the antennæ, which project beyond the palpi. Eyes large, occipital. Proboscis armed with prickles as usual. Jaws chestnut-brown towards the apex, serrated with five denticulations. Tentacular cirri as long as, or longer than, the breadth of the body. Post-occipital segment rather larger than the one behind. Segments about 110, smooth, marked with two or three rugæ above the insertions of the feet (No. XXXII.), which are well developed and crowded on the posterior half. Anterior feet normal, with short papillary branchial lobes, of which the dorsal one is the largest and most prominent. The posterior feet are complicated and much unlike the others, for above the base of the superior lobe there is a helmet-shaped compressed crest; and the superior setigerous tubercle is also furnished with a very large kidney-shaped, veined, leaf-like lamina, under which there is a small oblong lobe; while the ventral cirrus has appended beneath its base another kidney-shaped leaf-like lamina, and a curved lobule on its upper side. Dorsal cirrus much longer than its lobe; that of the middle feet crenated on the under side: ventral cirrus rather long. Bristles slender, forming considerable brushes on the middle and posterior feet. Spines dark brown.

Specimens preserved in spirits are of a uniform pearl-grey colour, with pale yellowish feet.

Heteronereis renalis is in many respects so much like the *H. lobulata* of Savigny, that I have hesitated in describing them as distinct species; but the dissimilarity in the structure of the feet, though apparently slight, and difficult to be expressed in a definition, seems to be of a kind that nothing less than specific origin could produce. In *H. lobulata* the leaf-like lamina of the setigerous tubercle is oval, and not more than half the size it has in *H. renalis*; and the foliaceous appendage to the ventral cirrus in the former is also proportionably small, and of a roundish figure, without any additional lobular appendage.

Nereis margaritacea, described in the 'Annals,' vol. iii. p. 294, is also nearly allied to this species, and is, I suspect, the same as the *Nereis podophylla* of Savigny. It requires re-examination; and I would remark, that as these species are easily injured, and their appendages tear and fold up readily, several feet ought to be examined before fixing on their true shape and character. I had made several figures of the feet of *Heteronereis renalis* before the one now given, which, I believe, exhibits a correct outline of its ordinary conformation.

No. XXXII.—*Heteronereis renalis.*



There is such a close resemblance between the shape of the feet in our *Heteronereis renalis* and the *H. fucicola* of Oersted, that they might be presumed to be synonymous; but the latter differs in having very long tentacular cirri. It is also a much smaller species.

Obs. The tentacular cirri are as long as, or longer than, the breadth of the post-occipital segment, which is rather longer than the second. There were 110 segments in one specimen; they are crowded on the posterior portion.

3. **H. longissima**, jaws obsoletely serrated at the base, plain towards the points; proboscis without prickles; dorsal lobe with a compressed crest; the setigerous branch with a large kidney-shaped lamella, and a small one of the same shape is appended to the base

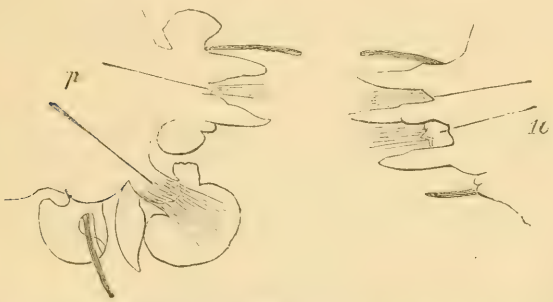
of the ventral cirrus; superior cirrus overreaching its lobe. Length 18″.

Nereis longissima, *Johnston in Ann. Nat. Hist.* v. 178.
Heteronereis paradoxa, *Oersted, Grœnl. Annul. Dorsibr.* 23. f. 50, 63, 64 & 66; *Kroyer's Naturh. Tids.* 1842, 116.
Nereis paradoxa, *Grube, Fam. Annel.* 50.

Hab. Coast of Ireland.

Desc. The specimen before me is of the extraordinary length of 2 feet! but as it has become very soft in the spirits, it would perhaps not much exceed 18 inches when alive. It is of the thickness of a goose-quill, and of a pearl colour with olivaceous feet, which are very large and flexile. Head distinct, rather small, obtusely triangular; the antennæ minute and shorter than the palpi. Proboscis

No. XXXIII.—*Heteronereis longissima.*



N.B. The numbers affixed to the Woodcut figures express the number of the segment from which the foot was taken that served for the figure; *m* means that the foot was from near the middle; and *p*, from near the posterior extremity of the body.

large, destitute of all horny prickles, but armed with powerful jaws, which are only faintly serrulated near the base. Post-occipital segment not larger than the second. Tentacular cirri short, not so long as the breadth of the segment. Segments very numerous. Feet (No. XXXIII.) of the anterior pairs with three rather long papillary and equal branchial lobes, the dorsal cirrus not reaching much beyond their apices; but the posterior feet much resemble those of *H. renalis*.

Although the size of an animal is not usually reckoned a good specific character, yet we know that every species has in this respect certain limits which it never either much exceeds or falls short of. For this reason, it seems to me impossible to regard *Heteronereis longissima* as a variety of *H. renalis*, notwithstanding the similarity in the structure and figure of the feet would induce that belief; and I have been fain to resort to the distinctions afforded by the jaws and proboscis for their separation. This is the only known species with a

prickless proboscis; and the serratures of the jaws are likewise fainter than in any other I have examined. As the specimen of *H. longissima* is not in a good condition, some allowance will be made, should the outline given of the posterior foot be found not wholly exact; but I am confident that the general contour and proportions are accurately expressed.

Before I examined this worm, I had mistaken it for a species of *Phyllodoce*, which it more resembles in size and general aspect than a *Heteronereis*, and it is obviously a *transition* species, proving the affinity of these two genera. The foliaceous lamellæ of the feet are quite similar in structure to the branchial leaflets of the *Phyllodoce*, and, from the manner in which they are veined, are evidently also branchial in their function.

Obs. A large species, with much of the habit of a *Phyllodoce*. Post-occipital segment not longer than the second; tentacular cirri short, not so long as the breadth of the segment. Segments very numerous; the feet of the anterior with three rather long papillary and equal lobes, the dorsal cirrus not reaching much beyond the apex of the dorsal lobe.

4. **H. margaritacea**, jaws with five to six denticulations, plain at the apex; post-occipital segment twice as long as the second, with tentacular cirri about equal to its diameter; feet lobulated, the lobes oblique, the dorsal without a crest, and overtopped by its cirrus; foliaceous lamella one only, cordate; inferior cirrus with a papilla at its base. Length 4″. Plate XV. fig. 3.

Nereis margaritacea, *Johnston in Ann. Nat. Hist.* iii. 294. pl. 6. f. 3.

Hab. The coralline region. Amongst the rocks at Milton, rare, *Montagu*. Coast of Berwickshire, rare.

Desc. Body about 4 inches long, rounded dorsally, and flattened on the belly, of a uniform mother-of-pearl colour, iridescent, the feet tinted with a dusky pale green. Head corneous, brown, subquadrangular. Eyes four, very distinct. Antennæ and palpi similar to those of *N. viridis*, nor is there any material difference in the proboscis, but the jaws are armed with only five or six denticulations, and the point is longer and smooth. Tentacular cirri subequal, reaching to the posterior margin of the post-occipital segment, which is twice as broad as the following. Segments rather narrow; the anterior with small feet, but they become gradually larger as we reckon backwards, attaining their maximum of development below the middle, whence they again begin to get less. Superior cirrus longer than the branchial lobule; the inferior cirrus of the anterior feet simple, that of the more developed feet with a lobe and short filament at its base. Bristles in two considerable brushes, colourless, compound, the point long and setaceous. Spines darker.

The species appears to be allied to the *Nereilepas variabilis* of Oersted, but they are distinct.

PLATE XV. Fig. 3 *a*. The head of *Heteronereis margaritacea*, with the proboscis protruded. 3 *b*. A jaw separated and magnified. 3 *c*. The foot of the 12th ring. 3 *d*. A foot from near the middle of the body, viewed laterally.

Fam. V. NEPHTHYACEÆ.

NEPHTHYDEA, *Grube, Fam. Annel.* 52.

Char. Body vermiform, tapered posteriorly, the anal segment with a single style: head small, angled, flattish, truncate in front, and furnished with four minute antennæ: mouth with a large clavate biarticulated proboscis, ciliated with two series of connivent papillæ at the longitudinally slit orifice, and with rows of similar sharp papillæ half-way down the posterior half: jaws two, small: no tentacular cirri: segments numerous, narrow, all of them footed: feet large, biramous, the branches wide apart, lobe-like, with a foliaceous lamina in front of each, and pendent underneath the superior a sickle-shaped branchial process; the inferior with a short cirrus at its base: bristles from the foot-branches behind the lamellæ, in spread fascicles, slender, weak and setaceous, simple and compound, the latter spliced at its junction with the shaft, and with the terminal piece acicular: a spine to each fascicle. Margaritaceous: arenicolous.

14. NEPHTHYS.

Nephthys, *Cuv. Règn. Anim.* 203. *Lam. Anim. s. Vert.* v. 313. *Savign. Syst. Annel.* 34. *Aud. & M.-Edw. Litt. de la France*, ii. 232. *Blainville in Dict. des Sc. nat.* lvii. 483. *Johnston in Loud. Mag. Nat. Hist.* viii. 341. *Williams in Rep. Brit. Assoc.* 1851, 215, *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 404.

Char. The only genus of its family.

1. **N. cæca**, dorsal lamella suboval, twice as large as its setigerous lobe; inferior lamella larger than the dorsal, broadly ovate or heart-shaped, with a small cirrus at its base; bristles weak, rather loosely fasciculate, and not much protruded beyond the edge of the lamellæ; dorsal cirrus none. Length 6–10″; breadth 4‴.

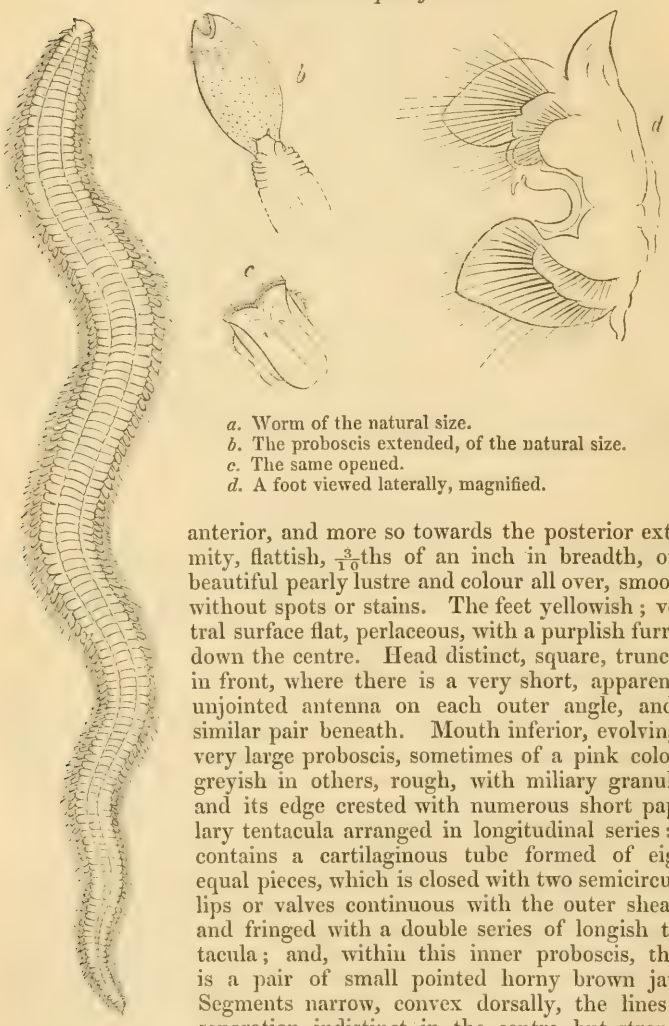
Nereis cæca, *Fabric. Faun. Grœnl.* 304. *Turt. Gmel.* iv. 90.
La Néréide aveugle = a species of Aonis, *Aud. & M.-Edw. Litt. de la France*, ii. 264.
Nephthys clava, *Blainv. Dict.* lvii. 483.
Nephthys margaritacea, *Johnston in Loud. Mag. Nat. Hist.* viii. 341. f. 33. *W. Thompson in Ann. & Mag. Nat. Hist.* xiii. 439.
Nephthys cæca, *Oersted, Grœnl. Annul. Dan.* 41. f. 73, 74, 77–86; *Kroyer's Naturh. Tids.* 1842, 123. *Grube, Fam. Annel.* 53.
Nephthys ciliata?, *Rathke in Nov. Act. Acad. Cæs. Leop.* xx. 171, *Ray Soc. Rep.* 1847, 507.

Nereis (Nephthys) lineata, *Dalyell, Pow. Creat.* ii. 146. pl. 21. f. 4–10.
White-worm, Lurg or Lurgan, *Drummond in Loud. Mag. N. H.* ii. 121.
The white Rag-worm, *Prov.*

Hab. The littoral region, common.

Desc. Body from 6 to 10 inches long, tapered slightly towards the

No. XXXIV.—*Nephthys cæca.*



a. Worm of the natural size.
b. The proboscis extended, of the natural size.
c. The same opened.
d. A foot viewed laterally, magnified.

anterior, and more so towards the posterior extremity, flattish, $\frac{3}{10}$ths of an inch in breadth, of a beautiful pearly lustre and colour all over, smooth, without spots or stains. The feet yellowish; ventral surface flat, perlaceous, with a purplish furrow down the centre. Head distinct, square, truncate in front, where there is a very short, apparently unjointed antenna on each outer angle, and a similar pair beneath. Mouth inferior, evolving a very large proboscis, sometimes of a pink colour, greyish in others, rough, with miliary granules, and its edge crested with numerous short papillary tentacula arranged in longitudinal series: it contains a cartilaginous tube formed of eight equal pieces, which is closed with two semicircular lips or valves continuous with the outer sheath, and fringed with a double series of longish tentacula; and, within this inner proboscis, there is a pair of small pointed horny brown jaws. Segments narrow, convex dorsally, the lines of separation indistinct in the centre, but strongly marked along the sides; about 140 in number (in two specimens of average size 143 were counted), the anterior streaked with pale

lines across the base of the feet. Feet greatly developed, increasing gradually in size to about the middle of the body, whence they again decrease towards the tail, very deeply divided into two branches: the dorsal branch rather less than the ventral, furnished with a perpendicular lamellar somewhat ovate process, with a small appendage of the same character at its base, a small cirrus, and an elongate branchial filament curved like a reaping-hook; the setigerous processes obtuse, broad, shorter than the lamellæ; the inner armed with a row of long, and the outer with a row of short bristles: ventral branch much like the dorsal, the lamella larger, with a small cirrus at its base. Bristles dusky, longer than the processes, very slender, setaceous, smooth, simple, each brush with a brown spine. The short bristles look as if they were abruptly broken off, but they are uniform on all the feet, and appear to be pointed under the microscope. Anus terminal, superior; the segment small, apodous, terminated with a style.

This worm is remarkable for the splendour of its colour, which is exactly similar to that of mother-of-pearl; but the silvery lustre is confined to a space down the back and belly, for the sides and feet are of a yellowish hue, the inner base of the feet reddish, and the bristles dusky. When the foot is removed, and placed under a magnifier, it has a sort of resemblance to a horse's hoof; and is a very wonderful and beautiful piece of mechanism. The creature lives in the sand, in which it burrows by means, principally, of its strong proboscis. With this, used as a wimble, it opens up the way, the body being held steady with the aid of the setigerous feet. It thus buries itself with almost incredible velocity: nor is it less active in the water, should it accidentally be removed from its furrow and cast in the open sea,—swimming rapidly, with a serpentine wriggling motion, and propelled, unquestionably, by the lamellæ which project from each side, like a double bank of oars.

From *Nephthys Hombergii* our species differs very much in the construction and form of the processes of the feet; while in the shape and colour of the body they seem very nearly to agree. To no other species which has been accurately defined can it be referred; but ours may be conjectured to be the *Nereis clava* of Leach. I have no means of deciding the point; and Blainville has, it would appear, introduced such an almost inextricable confusion into the nomenclature of that species, that it might be scarcely advisable to restore the name. The figure he has given (*Dict.* pl. fig. 1) does not facilitate the solution of the question.

To the marine Annelides in general, fresh water is a deadly poison (*Loud. Mag. Nat. Hist.* ii. p. 402*); and Dr. Drummond has told its effects on the *Nephthys* in an interesting manner:—"On putting one of them," he says, "into a basin containing some fresh water it sank to the bottom, and lay for a moment motionless, as if stunned. It then dashed here and there through the water, violently lashing its anterior and posterior ends from side to side; but this extreme

* "Il est même à remarquer qu'il est peu d'êtres marins qui meurent aussi vite quand on les met dans de l'eau douce; il semble que ce soit pour eux une liqueur corrosive."—*Blainv. Dict. des Sc. nat.* lvii. p. 409.

agitation continued only a few seconds, when the animal subsided to the bottom, unable to exhibit any further signs of motion than some partial convulsive twitches in different parts of its body, or a quivering here and there in its segments or articulations. The skin of the body was contracted in various places, so as to present a wrinkled or withered appearance. In six minutes from the immersion the animal seemed perfectly dead; the wrinkled appearance of the skin was gone, and not the slightest mark of irritability appeared in any part. The other specimens, eight in all, exhibited the same phænomena with little variance. None of them showed any appearance of vitality after ten minutes' immersion. Three of them protruded very slowly their remarkable ventricose proboscis (if the latter term can be at all appropriate) during their last expiring moments, and so it remained after death.

"I allowed the above specimens to remain in water all night; and on the following morning, on going to put them in spirits in order to preserve them, I was surprised to find them so rotten, that they fell in pieces by their own weight, and were quite useless as specimens. They had not, however, acquired any offensive or putrid smell.

"Some days afterwards I obtained a fresh supply of living specimens, some of which were entire; but a number of them were in fragments, having been cut through by the spade in digging. The latter were quite alive, and seemed to have suffered no more in point of vitality by having been cut, than the common earthworm does under similar circumstances. I had proof, too, that the being cut through does not prove fatal; for, in one of the entire specimens, about two inches of the tail end was a new production. The animal had, at some prior period, been severed by the bait-digger, and a new portion had been restored. This portion, as is generally the case with reproductions, was smaller in diameter than the rest of the animal. It was also of a paler hue, and the line of demarcation between the old and the new parts was very distinctly marked.

"The separate pieces of the cut worms, even those which wanted both head and tail, were affected by the fresh water in the same way as the entire specimens: they were first thrown into violent convulsions, then became affected with transient spasms, and, in a few minutes, all appearance of vitality was extinguished.

"The first idea that struck me, as to the possible cause of these phænomena, was, that perhaps the water, from wanting the density of sea water, was unfit for respiration, and that therefore the animals had died of suffocation. Pennant states that the torpedo dies in fresh water almost as soon as in the open air; but I had already ascertained that these worms will remain in air for many hours, without seeming to suffer any inconvenience.

"I had a number of specimens lying on a plate motionless; for, unless disturbed, they are little inclined to move. I dipped my hand in fresh water, and with a jerk, sprinkled some drops of it over the plate, and the specimens on it. In about two seconds the worms were all in violent agitation, rolling round on the longitudinal axis of their bodies, and writhing together in apparent agonies. After a

few minutes the agitation ceased, and they again lay motionless. I now tried the effect of touching an individual with a small drop of fresh water. The part to which the latter was applied almost immediately contracted in the manner that a leech contracts at the place where a little salt is applied to it, and then the whole animal became agitated, and dashed violently about the plate, frequently, at the same time, protruding and contracting its proboscis. Similar effects followed every trial I made, and it mattered not what part of the animal was touched: the smallest drop of water from the point of a probe produced the partial contraction at the part, and then the general convulsive writhing and agitation of the whole body. Even fragments of the worm were similarly affected. It appeared to me, however, that the mouth extremity was more sensible to the touch of the poison than any other part, as the convulsive efforts which followed seemed more violent and longer continued than when the water was applied elsewhere.

"I made similar trials on many of these animals, and invariably found the same results. The most striking way of exemplifying the virulent effects of fresh water is, when the worm is at rest, to apply consecutively from the point of a probe ten or a dozen small drops of *sea water* to any part of it; this causes no alteration; the animal continues motionless. If we then change the drop to be applied from salt to fresh, the very first application of the latter immediately produces the phænomena above described.

"In whatever way it is that fresh water proves so poisonous and fatal to this species, one thing is obvious, that the animal can never propagate except under the influence of sea water. It can never colonize rivers or lakes; and the subject, if further pursued by experiments on other species, may, perhaps, throw some light on the distribution of animals. The Lurg-worms cannot even safely inhabit those parts of the shore which are long uncovered by the sea; a heavy shower of rain during ebb tide might destroy them; and it is only a casual circumstance that one of them is found in the usual place of digging for bait. They must be sought for at the verge of low-water mark, and they are only to be found in plenty, and of full growth, during the neap tides.

"The common Lug (*Lumbricus marinus*) is, on the contrary, generally dug out of the sand at a considerable distance from low-tide mark, and where it is left dry for many hours. Showers of rain, therefore, we should suppose, can exercise no deleterious influence on it; and accordingly I found that some lug, which I kept immersed for several hours in fresh water, did not seem to be at all incommoded by it."

According to Quatrefages, the poisonous effect is chiefly owing to the want of chloride of sodium (*Ray Soc. Rep. Zool.* 1847, 504).

(*a*) Tenby, *F. D. Dyster.*
(*b*) Falmouth.
(*c*) Berwick Bay, *Dr. Johnston.*
(*d*) Berwick Bay, *Dr. Johnston.*
(*e*) Littlehampton, Sussex, *Mus. Leach.*

2. **N. longisetosa**, feet with the branches wide apart, the margin of the intermediate space even; dorsal branch with a cirrus, the lamella dorsal, oblong, scarcely overreaching the apex; lamella of the ventral branch directed obliquely upwards, oblong, with an obtuse rounded apex; bristles long, protruded far beyond the lamella, setaceous, serrulated on the outer half on one side. Length 3–4″; breadth 2‴.

Nephthys longisetosa, *Oersted, Grœnl. Annul. Dorsibr.* 43. f. 75, 76. *Grube, Fam. Annel.* 53.

Hab. The littoral region.

Desc. Worm linear-elongate, narrowed insensibly from the head to the tail, somewhat convex on both dorsal and ventral surfaces, smooth, the median portion highly perlaceous, the sides of a uniform greyish-white or wax-yellow colour. Head small and indistinctly defined, forming a central lobe tipped with four small antennæ; the post-occipital segment dilated on each side, mammiform, with a small tuft of blackish bristles in the centre of each rising. Mouth large, in the ventral side of the post-occipital segment, transverse, with a prominent anterior lip; the proboscis ventricose or urceolate, rough near the top, with numerous spinose papillæ, while a close series of erect ones encircle the orifice. Rings very numerous, narrower than their diameter, similar; the feet prominent on each side, alike, but most developed near the middle of the body, and then about as long as half the diameter of the ring. Feet with their branches widely separate; the superior with an obtuse setigerous papilla, to which is attached, on the upper side, an oval foliaceous lamella, and on the under side, near its apex, a sickle-shaped cirrus, with a short spur and small sinus at its insertion. Inferior branch rather longer than the superior, lobe-like, obtusely pointed, tipped with an oblong foliaceous lamella as long as the setigerous process itself; the inferior cirrus short, setaceous, swollen at its base. The space between the branches is greater than the length of either branch of the foot, and its outline is concave or almost straight. Each branch is armed with two spines of a light brown colour, and with a spreading fascicle of numerous delicate bristles, which are dusky or black to the naked eye. When highly magnified they appear colourless and crystalline, and are so weak that they easily bend or assume a wavy outline. There are three kinds of them: the first is simple, long and unequal, cylindrical and smooth at the base, bulging out a little above it, and thence gradually tapered to a long setaceous point, the inner edge from the bulging upwards being denticulated in the most minute and regular manner (Pl. III. fig. 9). The second kind is equal to the first in length and size, and similar in shape and in the manner in which it is serrulated; but it is jointed near the commencement of the bellying, and the joint is like the separation of a rod that has been spliced (Pl. IV. fig. 11). The third kind is very short, simple, setaceous and straight, serrulated on all sides, and

only smooth at the base. A high magnifier is required to see the serratures.

Obs. Smaller than the preceding, from which it is readily distinguished by the length and number of its fasciculated bristles, which exceed the length of the entire foot, and protrude far beyond the margin of the lamella. They become quite black in spirits. The upper half of the simple ones is delicately serrulated along one edge; and the terminal piece of the compound ones is equally serrulated, as well as the upper end of the shaft.

(*a*) Firth of Forth, *Lieut. Thomas, R.N.*
(*b*) Berwick Bay, *Dr. Johnston.*
(*c*) Holy Island, *Dr. Johnston.*

3. N. Hombergii.

Nephthys Hombergii, *Cuv. Règn. Anim.* iii. 203. *Savign. Syst. Annel.* 34. *Lam. An. s. Vert.* v. 313; 2de édit. v. 552. *Aud. & M.-Edw. Litt. de la France,* ii. 235. pl. 5 B. f. 1–6; *Ann. des Sc. nat.* xxviii. 257. pl. 17. f. 1–6. *Blainv. Dict. des Sc. nat.* lvii. 483. *Williams in Rep. Brit. Assoc.* 1851, 188, 199, 235, *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 408. pl. 14. f. 7.

Hab. The littoral region.

Obs. I have given no character of this species, of which I have not seen a specimen; nor am I satisfied with the evidence of its being a native.

Fam. VI. PHYLLODOCIDÆ*.

Phyllodocidæ, *Williams, Rep. Brit. Assoc.* 1851, 211 & 232.
Phyllodocea, *Grube, Fam. Annel.* 54.

Char. Body scolopendriform, with many or numerous segments deeply incised at their junctions; the anal segment with two styles: head small, flattened, sometimes deeply inserted into the post-occipital segment, and not distinctly separated from it, with four or, rarely, two filiform antennæ on the front margin, and sometimes a fifth on the vertex: eyes two or four: post-occipital and the two following segments with tentacular cirri in two, four, or eight pairs: mouth with a long cylindrical or clavate bisegmented proboscis, encircled with papillæ at the orifice: feet protuberant, simple or,

* Agassiz says, from φύλλον, a leaf, and δοκέω, to resemble; but it is the name of a sea-nymph, of the train of Cyrene.—*Virg. Georg.* iv. 336. It is synonymous with the *Nereiphylle* of Blainville, but not with the *Phyllodoce* of Ranzani. A genus of plants has been named *Philodice*, and to those who think it against the canon to give the same name to any subjects of Fauna and Flora, this might be a reason to prefer the nomenclature of Blainville. Risso writes the name *Phyllidoce.*

rarely, biramous, similar to each other, with a dorsal and ventral cirrus, the dorsal generally foliaceous and branchial: bristles slender, compound: a spine to each ramus.

Obs. The Phyllodoces are the most beautiful worms* among the Nereides, and are readily distinguished by the series of compressed foliaceous lamellæ, originating immediately above the insertions of the feet, which garnish the sides of the body. The peculiar office of these organs is conjectured to be respiratory†, but they also aid the animal in its progress through the water, for, following the motions of the feet, and capable of being partially altered from a horizontal to a perpendicular position, they act as a bank of oars, and must be especially useful when the worm glides from a solid surface, and finds itself unsupported in the water. Hence the species are quick and lively, and swim with considerable ease‡. We have found them buried occasionally in light sand between tide-marks; but they principally reside in deeper water amid the roots of corallines and the shells of mollusca and sedentary annelidans§. The body is much elongated and proportionably slender, composed of a numerous succession of similar segments, narrowed gradually towards each extremity, more especially towards the posterior, which is terminated by two short fleshy styles. From the mouth is protruded at will a large proboscis, divided into two rings by a fold sometimes scarcely visible (Pl. XVI. fig. 3); the under half on the whole roughened with fleshy papillæ arranged in rows, while a series of larger papillæ encircles the orifice. There seem to be two eyes only‖, occipital in position, and larger than in the allied genera. The front of the head is armed with four small simple antennæ; and on each side of the post-occipital ring there are two pairs of unequal tentacular cirri, jointed at the base, and usually kept retroverted when the creature is at rest. The feet are rather small, uniramous, furnished with a single spine, and a brush of very elegant, slender bristles, divided by a joint near the middle into two portions, of which the terminal one is as sharp as the finest needle (fig. 6).

In the Phyllodoces the blood is not red as in the great majority of the Annelides, but yellowish or colourless¶.

* "Virgines pulcherrimæ inter Nereides."—*Otho Fabricius.*

† Cuv. Règn. Anim. iii. p. 202. It would be wrong to overlook their resemblance to the branchiæ in the larvæ of the Ephemerides. See Reaumur, Hist. des Insectes, vi. p. 468. pl. 45. f. 2.

‡ "Currit egregie; natare etiam valet lamellis suis retroversis oblique sursum erectis."—*Fabr. Faun. Grœnl.* p. 298.

§ Audouin and M.-Edwards, Litt. de la France, i. p. 237.

‖ According to Lamarck, four, "mais les postérieurs sont peu apparens."—*Anim. s. Vert.* 2de édit. v. p. 556.

¶ Lam. Anim. s. Vert. 2de édit. v. p. 556. Ann. des Sc. nat. n. s. x. p. 197. See also Williams, Rep. Brit. Assoc. p. 212.

* The body with numerous segments, elongated: dorsal cirrus foliaceous, branchial. *Phyl. genuina.*

15. PHYLLODOCE.

Phyllodoce, *Cuv. Règn. Anim.* iii. 202. *Savign. Syst. Annel.* 42. *Lam. Anim. s. Vert.* v. 316. *Aud. & M.-Edwards, Litt. de la France,* ii. 219. *Fleming in Ency. Brit.* edit. 7. xi. 220. *Johnston in Ann. Nat. Hist.* iv. 224. *Williams in ibid.* ser. 2. xii. 402, *and in Rep. Brit. Assoc.* 1851, 197, 212, 615. *Oersted, Annul. Dorsibr.* 37, *and in Kroyer's Naturh. Tids.* 1842, 120.
Nereiphylla, *Blainv. in Dict. des Sc. nat.* lvii. 465.

Char. Head distinct: eyes two or four: proboscis long, tomentose or papillary on the surface: antennæ four or five, the odd one on the vertex: tentacular cirri four pairs, unequal, setaceous: feet uniramous, with foliaceous cirri, the dorsal largest, partially overlapping the back, or laid along the sides.

† Antennæ 4 = Phyllodoce, *Savigny & Oersted.*

1. **Ph. lamelligera**, tentacular cirri about twice as long as the diameter of the body, which is a green or bluish colour with metallic lustre, the branchial cirri olivaceous; segments about equal in length; cirri heart-shaped, the inferior about one-half the size of the superior. Length 2′; breadth 4‴. Plate XVI. fig. 1–6.

Nereis lamelligera, *Turt. Brit. Faun.* 135. *Jameson in Wern. Mem.* i. 557. *Penn. Brit. Zool.* edit. 1812, iv. 96.
Phyllodoce laminosa, *Savign. Syst. Annel.* 43. *Aud. & M.-Edwards, Litt. de la France,* ii. 222. pl. 5 A. f. 1–8. *Rathke in Nov. Act. Curios. Acad. Leop.* xx. 169. *Grube, Fam. Annel.* 55.
Phyllodoce gigantea, *Johnston in Zool. Journ.* iv. 53.
Nereiphylla laminosa, *Blainv. Dict.* lvii. 466.
Phyllodoce lamelligera, *Johnston in Ann. Nat. Hist.* iv. 225. pl. 6. f. 1–6, and xiii. 438.
Nereis foliosa, *Leach, Mus.*
Nereis remex, *Dalyell, Pow. Creat.* ii. 148. pl. 23. f. 1–7.

Hab. The Laminarian region.

Desc. Body 14 inches to 2 feet long, linear-elongate, somewhat compressed, tapered at the tail, smooth, dusky, with bluish and greenish shades reflecting a metallic lustre, the branchial leaflets generally clouded in the centre with a dark undefined spot. Head quadrangular; the proboscis covered, on its lower half, with fleshy papillæ arranged in about twelve rows. Eyes black. Antennæ very short, conical. Segments very numerous, the post-occipital not larger than the following, bearing on each side four rather short setaceous tentacular cirri, of which the two anterior are shorter than the posterior pairs, and under these there is a concealed rudimentary cirrus. Feet all alike, the superior cirrus forming an obliquely heart-shaped, shortly stalked leaflet, veined, entire, smooth; the inferior cirrus is similar in structure and nearly so in figure, but it is

about two-thirds less. Between them is the proper foot, not very protuberant, armed with a brush of bristles disposed in a somewhat semicircular manner, having a single straw-coloured spine in their middle. The bristles are slender, pellucid, jointed, the joint being cleft for the reception of the needle-like point. Posterior extremity terminated with two very short fleshy styles.

This species is said to attain sometimes a size considerably greater than that of the specimen just described, but on this part of the coast one of 14 inches length is rare, while examples varying from 4 to 8 inches are not uncommon. It is liable to much difference in the tints of its colour, and the green often predominates, while in young individuals the colour is not diffused over the segments, but confined to their margins, which are dusky, while the centre may be a pale yellow. In these also the spots in the centre of the branchial leaflets are usually well marked. These are liable to be slightly affected in their form by the motion and contractions of the worm; and near the tail they always incline more to the oval than the heart-shape. The proboscis is either clavate or cylindrical, according to its degree of protrusion. The worm tints the spirits in which it is preserved with a greenish colour. The body becomes bluish or greenish-grey, and the lamellæ a uniform olive.

"During the day this species lurks in concealment, especially under any large flat shell, where it reposes, and unfolds from its many convolutions at night, apparently in quest of prey. Perhaps it feeds on the smaller living animals, for which the size and action of the proboscis seem peculiarly adapted. Sometimes, but not very seldom, portions of mussel have been absorbed; and once it seemed to me that a large specimen had devoured a smaller, which occupied the same vessel, as its disappearance could not be otherwise accounted for. But all kinds of sustenance are almost invariably refused; and the animals become lank and emaciated from protracted abstinence.

"The mechanism of this creature, its parts, and their powers, are to be ranked among the more conspicuous and admirable works of the creation; nor can they be contemplated without wonder. Issuing forth from its retreat, it swims by an undulating serpentine motion in the water. Its unwieldy body, gradually withdrawn from its retreat, has its multiplied organs unfolded in regular order and arrangement; so that, whether intertwined or free, neither are disturbed by intricacy or confusion; each performs its own proper functions, and the general effect by the united exercise of the whole. When inactive, the lateral parts of the segments generally close over the back; in activity, they open widely, as if so many oars to aid the animal's course, by their successive impulse on the water."—*Dalyell, Pow. Creat.* ii. p. 150.

Obs. A very remarkable worm; the body a rich iridescent blue and green, with a dusky line across at the sutures, while the feet form a brown or olivaceous fringe along the sides. Small specimens are common, but specimens 2 feet in length are rather rare. There is a specimen of this size in the Museum; and I have seen a larger one.

(*a*) Black Rock, Firth of Forth, *Leach.*
(*b*) Berwick Bay, *Dr. Johnston.*
(*c*) Falmouth.
(*d*) South Devon, *G. Montagu.*

PLATE XVI. Fig. 1. *Phyllodoce lamelligera*, of the natural size. 2. The head and proboscis, as this appears when half extruded, magnified. 3. The proboscis fully protruded. 4. Two segments magnified. 5. A lateral view of the foot reversed. 6. The setigerous papilla with its bristles and spine.

2. **Ph. bilineata**, head twice as long as broad, rounded in front; tentacular cirri three times the length of the diameter of the body, which is a pale greenish-yellow, with a continuous dark line down each side, sinuous at the insertions of the feet; segments nearly similar; dorsal cirrus ovate or elliptical; the ventral papillary. Length 1–3″. Plate XVI. fig. 7–10.

Phyllodoce bilineata, *Johnston in Ann. Nat. Hist.* iv. 227. pl. 6. f. 7–10. *Grube, Fam. Annel.* 56.

Hab. The littoral and laminarian regions.

Desc. From 2 to 3 inches long, very slender, serpentine, somewhat narrowed in front, more so towards the tail, of a pale greenish-yellow colour, with a dark continuous line along each side, rendered sinuous by the emarginations at the junction of the segments, which are numerous and quadrangular. Head ovoid. Eyes two, placed backwards. Antennæ four, unequal, placed in a stellate fashion round the orifice of the mouth. Tentacular cirri rather short, unequal. Branchial lamellæ ovate or elliptical, smooth, veined; the inferior cirrus short and papillary, not extending beyond the apex of the foot, which is slightly emarginate, and armed as usual with a brush of slender jointed bristles and a single spine.

Obs. In a description of a *Phyllodoce*, which is evidently identical with my *bilineata*, Mr. Dyster says that there are five antennæ, the posterior one "very minute." In specimens not exceeding an inch in length, the same accurate observer counted 160 segments. There are two eyes.

PLATE XVI. Fig. 7. *Ph. bilineata*, natural size. 8. The head. 9. The middle segments; and 10. The caudal extremity:—magnified.

3. **Ph. maculata**, the body marked with dark brown spots in three rows, three on every segment; head longer than broad, rounded in front; tentacular cirri three times longer than the diameter of the body; foliaceous cirrus broadly ovate, somewhat stalked. Length 4″.

Nereis maculata, *Linn. Syst.* 1086. *Müll. Zool. Dan. Prod.* 217. *Bosc, Vers*, i. 171.

Die geflechte Nereide, *Müll. Wurm.* 156. tab. 10, copied in *Encyclop. Méth. Vers*, pl. 57. f. 1–6.
Phyllodoce pulchra, *Johnston in Zool. Journ.* iv. 54.
Phyllodoce maculata, *Johnston in Ann. Nat. Hist.* iv. 227. pl. 7. f. 1–3.
Phyllodoce Mulleri, *Grube, Fam. Annel.* 56.

Hab. The shore at and within tide-marks.

Desc. Worm sometimes 4 inches long, slender, depressed, tapered a little towards each extremity, yellowish, with a row of dark brown spots along the back, and the sides spotted with the same colour; ventral surface paler, with a median row of small rather distant spots, and a series of larger ones on each side at the base of the feet. Head bluntly pointed, armed in front with four white conical antennæ. Eyes black. Post-occipital segment with four pairs of setaceous tentacular cirri, of which the two anterior are the shortest. On each side of the other segments there is an oval or somewhat heart-shaped branchial lamella, with a brown spot in its centre, and supported on a very short spotted stalk. Beneath them are the feet, each foot consisting of two papillary processes, the superior furnished with a brush of retractile bristles of the usual character. Anal segment terminated with two short conical styles.

Obs. A very beautiful species. There are two eyes. The dorsal cirri are much compressed, between elliptical and heart-shaped. The anal styles are short.

(*a*) Berwick Bay, *Dr. Johnston.*

†† Antennæ 5 = Eulalia, *Savigny & Oersted.*

4. **Ph. viridis**, body subcylindrical, of a uniform grass-green colour; head entire and rounded in front; the first pair of tentacular cirri attached to the first segment; eyes two; foliaceous cirri lanceolate, oblique. Length 2–3″. Plate XVI. fig. 11–15.

Nereis viridis, *Linn. Syst.* 1086. *Müll. Zool. Dan. Prod.* 217. no. 2636. *Fabric. Faun. Grœnl.* 297. f. 6. *Turt. Gmel.* iv. 88; *Brit. Faun.* 135. *Adams in Linn. Trans.* v. 8. *Bosc, Vers*, i. 171. *Penn. Brit. Zool.* edit. 1812, iv. 94.
Die grune Nereide, *Müll. Wurm.* 162. tab. 11, copied in *Encyclop. Méth. Vers*, pl. 57. f. 7–11.
Phyllodoce clavigera, *Aud. & M.-Edw. Litt. de la France*, ii. 226. pl. 5 A. f. 9–13. *Rathke in Nov. Act. Acad. Cæs. Leop.* xx. 170. *Cuv. Règn. Anim. Annel. Illustr.* pl. 13. f. 3.
Nereiphylla viridis, *Blainv. Dict.* lvii. 466, *Atlas*, pl. fig. 2.
Phyllodoce viridis, *Johnston in Ann. Nat. Hist.* iv. 228. pl. 6. f. 11–15, and xii. 439. *Grube, Fam. Annel.* 56.
Eulalia viridis, *Oersted, Annul. Dan. Consp.* 27. f. 22, 30, 85, 86 & 88; *Annul. Dan. Dorsibr.* 36, *and in Kroyer's Naturh. Tids.* 1842, 122.

Hab. The littoral region: common.

Desc. Worm from 2 to 3 inches long, elongate and narrow, slightly tapered towards the head, more so at the tail, of a uniform duck-green colour, paler on the ventral aspect. Head small, narrowest in

front, but not pointed, the apex armed with four short conical antennæ, and a smaller antenna is less perceptible on the vertex. Eyes two*, occipital, dark brown. Mouth with a large clavate proboscis, greenish, rough under the magnifier, with minute papillæ, edentulous. Post-occipital segment with four tentacular cirri on each side, twice the length of the branchiæ, the anterior pair one-half shorter than the others, conical, simple. Segments very numerous, often defined by a line of deeper green, shorter than their breadth, smooth, convex dorsally. Branchial leaflets (or superior cirri) lanceolate, slightly compressed, retroflexed, longer than the foot, which is furnished with a bundle of very slender retractile acicular bristles, and with a single spine. Tail terminated with two fleshy styles, similar to the leaflets, but rather larger.

Ph. viridis lives under stones, or in the crevices of slaty rocks, between tide-marks; but it abounds most near low-water mark; nor is it uncommon among the corallines and shells that are never left uncovered by the tide. It is an active species in water, moving forwards principally by the oared leaflets that extend from the sides; but on dry ground its movement is slow, and the leaflets are kept applied to the sides and brought somewhat under the body. When kept in a vessel of sea-water, deprived of food, the green colour becomes less intense, and allows us to trace a darker intestine down the centre of the body. When specimens are put into spirits they give out a copious green liquor, and tinge the spirit deeply. Immersed in fresh water, the worm is evidently pained, but is not killed so instantaneously as some other marine worms are, and in dying does not separate and break in pieces.

I have not hesitated to refer this species to the *Ph. clavigera* of Audouin and Edwards, although some slight differences may be traced in our figures; for some experience has brought me to believe that, in comparing figures which have been made under the magnifier, we are not to look for an exact resemblance between them. I have seen figures drawn by the same individual, and from the same objects at somewhat distant periods, but with every desire to be accurate, between which the discrepancy was greater than could have been at first imagined. So also I have not expressed any doubt of their species being identical with the *Nereis viridis* of Otho Fabricius; for the only distinction pointed out by Audouin and Edwards between them is the absence of the odd antenna in the latter, and this is only inferred to be the case from the silence of the Greenland naturalist. But it is no imputation on the acknowledged accuracy of Fabricius to believe that this organ may have escaped his notice; for, even after having been made aware of its existence, I have sometimes found that it was no easy matter to bring it into view, and make it perceptible to others.

(*a*) Cullercoats, *J. Alder*.

(*b*) Holy Island, *Dr. Johnston*.

* Audouin and Edwards say four, disposed in a transverse line, and very small; but their figure shows two only.

PLATE XVI. Fig. 11. *Ph. viridis*, of the natural size. 12. The head and anterior segments magnified. 13. The head and proboscis extruded. 14. The middle segments seen from below. 15. The caudal extremity.

5. **Ph. ellipsis**, body marked transversely with regular dark fasciæ at the sutures; segments alike and equal; head semioval, rounded in front; posterior tentacular cirri elongated; eyes two; foliaceous cirrus elliptical. Length $2\frac{1}{2}''$; breadth $\frac{1}{2}'''$.

Nereis ellipsis, *Dalyell, Pow. Creat.* ii. 152. pl. 20. f. 7–10.

Hab. Shores of Scotland: rare.

Obs. "Colour greenish to the eye. The microscope discovers two double dark belts crossing the back, on a greenish-yellow broader predominant line."—*Dalyell.*

6. **Ph. Griffithsii**, straw-colour, with two interrupted brown fasciæ across each segment; segments alike and equal; head semielliptical, rounded in front; tentacular cirri longer than the diameter of the body; dorsal cirrus lanceolate, the ventral a roundish papilla; eyes two. Length 8–18‴.

Hab. The littoral region.

Obs. Body slightly attenuated at the head, and more so towards the tail. One $\frac{6}{10}$ths in length had 100 segments. The bands across the segments are darker at the middle and edges, so as almost to become spots. Eyes two, small. There are five antennæ, and four pairs of tentacular cirri, the first pair attached to the first segment, the second and third pairs to the second, and the fourth pair to the third segment. The dorsal cirrus is much larger than the ventral, which is roundish. The setigerous tubercle and setæ are inconspicuous from the back; and there is a single spine to each foot.—*F. D. Dyster.*

The specimens which I refer to this beautiful species have had their markings discharged by the spirits in which they are preserved; and now resemble in colour, as in form, the *Geophilus maritimus*. A specimen $1\frac{1}{4}''$ long had about 130 segments. The branchial cirrus is very accurately lanceolate-acute, and beautifully veined like a leaf, with a midrib reaching the point. The proboscis is one-third the length of the body, papillose.

(*a*) Torbay, *J. R. Griffiths.*

7. **Ph. cordifolia**, green; segments alike and equal; head semielliptical; tentacular cirri in four pairs, all attached to the first

segment; dorsal cirrus heart-shaped, pedicellate; the inferior conical.

Phyllodoce cordifolia, *F. D. Dyster in lit.*

Hab. On oyster-beds in 5 fathoms, *Dyster*.

Obs. Head small, conical, with two eyes near the posterior line. There are about 50 to 60 segments. Dorsal cirrus expanded into a cordate lamina indented at the base. Ventral cirrus short and conical. Bristles slender, with the acicular terminal piece serrulated along the edge, as seems to be the case in all the species. Very active, swimming with vigorous serpentine movements.—*F. D. Dyster*.

** The body proportionably short, and consisting of fewer segments; all the cirri filiform and elongate. *Hesionea* (p. 175).

16. PSAMATHE*.

Castalia, *Savigny, Syst. Annel.* 1820, 46. *Oersted, Annul. Dan. Consp.* 23. *Grube, Fam. Annel.* 58: not *Lamk.*
Psamathe, *Johnston in Loud. Mag. Nat. Hist.* ix. 14 (1836), *and in Ann. Nat. Hist.* iv. 229. *Grube, Fam. Annel.* 58.
Psammate, *Sars, Adriat. Havs Faun.* 9.
Halimede, *Rathke in Nov. Act. Curios. Cæsar.* xx. 167 (1843). *Ray Soc. Rep. Zool.* 1847, 507.

Char. Body scolopendriform; head small, with two small antennæ and two palpi alike in form; eyes four, in pairs: proboscis short and cylindrical, furnished with a pair of slender, weak, light-coloured jaws, and encircled on the orifice with papillæ: post-occipital segment similar to the others: tentacular cirri four pairs, unequal, elongate: "feet with two branches, the superior very minute, the inferior large, three-lobed, a single spine in the superior branch, three in the inferior; the bristles in the superior capillary and very slender; in the inferior much stronger and falcate."—*Oersted.*

This genus, which I have named *Psamathe*, in honour of the daughter of Nereus and Doris, will take rank, as it appears to me, between *Syllis* and *Hesione*. It differs from the first in the number and structure of the antennæ, in the form of the head, and in the arrangement of the eyes; and from the latter in the form of the body (which is, in this family, an important character) and in the structure of the proboscis. In *Hesione* this is very long, and destitute of oral tentacula.

* A Nereid:

"And Psamathè for her brode snowy brests."—Spenser.

Sars writes the name *Psammate* (*Adriat. Havs Fauna*, p. 9). According to Oersted, the genus is the same as the *Castalia* of Savigny, instituted in 1817. It is undoubtedly synonymous with the *Halimede* of Rathke.

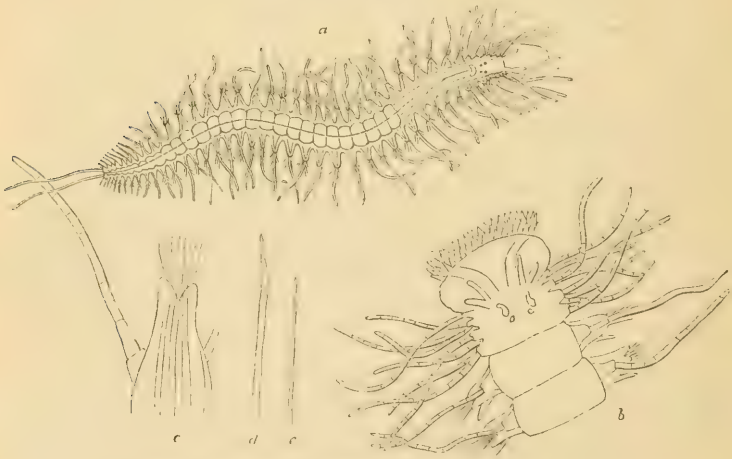
1. **P. punctata,** papillæ on the orifice of the proboscis numerous and close; dorsal cirrus filiform, longer than the diameter of the body, distantly jointed. Length 1″. Plate XIV. fig. 4.

Nereis punctata, *Müll. Zool. Dan. Prod.* no. 2633; *Zool. Dan.* ii. 28. tab. 62. f. 4, 5. *Turt. Gmel.* iv. 89.
Nereis rosea, *Fabric. Faun. Grœnl.* 301. *Baster. in Phil. Trans. Abridg.* xi. pl. 5. f. 28?
Psamathe fusca, *Johnston in Loud. Mag. Nat. Hist.* ix. 15. f. 1, *and in Ann. Nat. Hist.* iv. 230. pl. 7. f. 4. *Williams, Rep. Brit. Assoc.* 1851, 213. *Grube, Fam. Annel.* 58.
Castalia punctata, *Oersted, Annul. Dan. Consp.* 24. f. 15, 63, 64, 65 & 69.
Nereis punctata villosa, *Dalyell, Pow. Creat.* ii. 158. pl. 21. f. 11–13.

Hab. The littoral region.

Desc. Worm scolopendriform, about an inch in length, slightly narrowed in front, tapered towards the tail, of a purplish-pink, yellowish-brown or fuscous colour, and, in the paler specimens, a series of obscure spots may be observed down each side above the feet. Head (No. XXXV. fig. *b*) small, square, entire in front.

No. XXXV.—*Psamathe punctata.*



a. Psamathe punctata, considerably magnified.
b. The head, with the proboscis protruded, more highly magnified.
c. A foot, very much enlarged.
d. A bristle. *e.* A spine.

Eyes four, very distinct, occipital, placed in pairs. Antennæ four, short, biarticulate, frontal, the superior pair thicker and shorter than the inferior. Mouth furnished with a thick cylindrical proboscis, whose aperture is encircled with a close fringe of papillary tentacula. Tentacular cirri four on each side, the inferior pairs shortest, fili-

form, jointed, and issuing from a bulged base. Rings numerous, the anterior shorter and smaller than the others, which are nearly of the same length and breadth. Feet (fig. *c*) much developed and prominent, all alike, conic, the apex emarginate, or divided into two obtuse lobes, between which the bristles are protruded. Superior cirrus elongate, filiform, white, jointed like a Conferva, scarcely moniliform, and arising from a swollen basal joint; ventral cirrus short, extended or not beyond the apex of the foot, not jointed. Bristles (fig. *d*) all compound, colourless, strong, the point fixed on the shaft like the bill to the handle of a hedge-knife; they are collected into two small but unequal fascicles, having a rather small spine (fig. *e*) in the middle of each. Anal segment truncate, and terminated with two long styles similar to the tentacular cirri.

This little worm is occasionally met with in Berwick Bay, lurking amid the roots of Confervæ, corallines, and sponges; or under small stones in wet sandy soil. It advances through the water with considerable velocity and in a wriggling manner, pushing out and alternately withdrawing the bristles of its feet, and moving its long cirri in every direction. When the creature is first taken and active, the cirri have a somewhat moniliform appearance under the microscope, but as its energy declines this appearance becomes fainter; they then appear jointed like a common Conferva; and, after death, even these joints fade away, and the whole organ assumes a homogeneous structure.

When mature, I find that this worm attains the length of about $1\frac{1}{2}$ inch. If at rest, and in security, the colour of the back is a dirty green, but there is a narrow band of a purplish-pink colour on each side over the bases of the feet. Now let the worm be alarmed and put in motion, and this purplish colour spreads instantly over the whole body, rendering the worm very conspicuous. This phænomenon I noticed particularly in three fine specimens procured in April*. To observe them more at leisure, I put them into a saucer of salt water with some sand, and allowed them to remain over-night. In the morning nothing was to be seen of one excepting a portion of the anterior extremity. Unsuspicious of the truth, the two others were not separated, and in about six hours afterwards one only was left: he had, imitative of him who mars great Nature's plan, eaten his neighbour up entirely, the neighbour being quite equal to himself in size and strength. I hastened to preserve the cannibal; but when immersed in the spirits, he wriggled until he threw away nearly all his cirri, and then he separated himself into several mangled portions so as to render the body useless for even a coroner's inquest.

Obs. Oersted correctly says that I had overlooked the jaws on account of their minuteness and pellucidity, but they could not escape the observation of my friend Mr. Dyster, whose figure of them corresponds exactly with Oersted's description. The bristles are in two small and unequal fascicles, with a small spine in the

* Sir J. G. Dalyell says,—"Colour of the finest specimens scarlet; some are yellowish; but the colour is much dependent on the food. It feeds voraciously on mussel, darting out its proboscis, and absorbing a great quantity. The colour changes with the quality of the food."

middle of each; and the terminal piece of the bristle is elongate and falciform (*setæ spinosæ*, Oersted), serrulated along one edge, and terminated with a minute claw.

(*a*) Holy Island, *Dr. Johnston.*

PLATE XIV. Fig. 4. *Ps. punctata*, magnified. The line expresses the length of the specimen from which the drawing was made.

The *Halimede venusta* of Rathke differs in having apparently fewer tentacula on the oral orifice. The view he gives is a front one; whereas our figure is taken from a proboscis compressed between plates of glass, by which means the tentacula of both halves of the circle are at once brought into view, and appear crowded.

Fam. VII. GLYCERACEÆ *.

GLYCERAEÆ, *Oersted, Annul. Dan. Consp.* 32.
GLYCEREA, *Grube, Fam. Annel.* 59.

Char. Body vermiform, nearly cylindrical, tapered towards both ends, with numerous segments divided by plain sutures: head small and segment-like, produced into a conical annulated snout with four small antennæ on the apex: no eyes nor tentacular cirri: mouth inferior, with a thick clavate proboscis, emaxillary or usually armed with four hooked jaws, and sometimes also with a series of denticles inserted in the inferior half: post-occipital segment footed like the other segments: feet small, lobulated, with or without branchial simple lobe-like appendages; biramous, the rami partially coalescent: bristles in two fascicles, each with a spine; the bristles simple and compound, the terminal piece dovetailed into the shaft and acicular.

Obs. In all the *Nereides* which we have hitherto described, the head is to be readily distinguished by its enlarged form and its dissimilarity from the first segment; but in the *Glycera* there is no marked line of separation between these parts. The head has the appearance of a small pointed horn, and is indeed so like the anterior end of the Earth-worm, that we cannot but perceive, in this sameness of character, a certain approximation to a junction between the families to which the *Glycera* and Earth-worm respectively belong. Yet though this is unquestionable, still the *Glycera* is not the nearest connecting link, for there are other *Annelides errantes* which partake more of the habits and character of the *Terricolæ*.

17. GLYCERA.

Glycera, *Savign. Syst. Annel.* 36. *Lam. Anim. s. Vert.* v. 314. *Aud. & M.-Edw. Litt. de la France*, ii. 241. *Blainv. Dict. des Sc. nat.* lvii. 484. *Williams in Rep. Brit. Assoc.* 1851, 198, 214 (not *R. Brown*).

Char. Proboscis with four black spinous and hooked jaws placed

* From γλυκερὸς, *suavis*, pleasant to look upon.

in a square within the orifice, or without jaws: no lateral series of denticles: branchiæ none, or small and papillary: feet lobulated, the lobes subequal, the two mid ones setigerous, with a pale-coloured spine in each.

* Emaxillary.

1. **G. mitis**, proboscis without jaws; no branchiæ; dorsal cirrus lobe-like, as large but less prominent than the central lobes; ventral cirrus short and papillary. Length 12″; breadth 3‴.

Hab. Shores of Scotland, *Dr. Greville.*

Obs. In spirits the worm is of a light brown colour with a strong cupreous or bronzed lustre, and highly iridescent, which is uncommon in this family. The specimen was fully a foot in length, but it had become very soft, and was 4‴ in its greatest diameter. The segments are extremely numerous, estimated at not less than 240, narrow, dimidiate, smooth. The feet are all alike in conformation, small at first, but they soon become larger and fully developed, and continue so to the very extremity. Each foot consists of six lobules, of which the upper is the superior, and the under the inferior cirrus, while two of the intermediate are the setigerous branches. The bristles of the upper branch are simple and setaceous; those of the under bifasciculate, compound, the terminal piece dovetailed into the shaft, acicular and sharp-edged. The feet resemble those of *G. Rouxii*; nor would I have separated the worm as a species had I not satisfied myself that there were no jaws. It has no relation with *G. unicornis* of Savigny, which is equally emaxillary.

(*a*) Scotland, *Dr. Greville.*

** With four jaws: no branchial lobules.

2. **G. dubia**, segments biannulate, alike; setigerous lobes triangulate, rather shorter than the other lobes, which are papillary, and scarcely larger than the dorsal cirrus; inferior cirrus short and small. Length 4–8″; breadth 4‴.

Glycera dubia, *Blainv. Dict. des Sc. nat.* lvii. 484, with a fig. in the *Atlas*, copied in *Griffith's Cuvier*, xiii. t. 4. f. 1.
Glycera Rouxii, *Aud. & M.-Edw. Litt. de la France*, ii. 242. pl. 6. f. 5–10. *Grube, Fam. Annel.* 60.
Nereis tricolor, *Mus. Leach.*

Hab. South Devon.

Desc. Worm subcylindrical, being equally convex on the dorsal and ventral surfaces, elongated, tapered from about the middle to the tail, of a light brown colour, with a copper or bronzed lustre, iridescent, smooth; the rings extremely numerous, very narrow, many of them marked across with yellowish streaks. Head small and undefined, produced into a conical cornute snout, having the apex crowned with four spreading papillary antennæ. Mouth

with a long proboscis longitudinally striated, and consisting of two distinct portions, the basal more membranous and narrower than the distal, which is covered with small papillæ that give the surface a tomentose appearance under a common magnifier. Feet all alike in conformation : those of the anterior rings are not very protuberant and are proportionably small, but proceeding backwards they soon become sensibly more developed and continue so to the very extremity. Each foot is divided into five unequal lobules, of which the superior represents the cirrus, and is rather shorter than the setigerous lobules. These are equal in length, papillary ; and behind them are two lobules (branchial ?) more compressed and obtuse. The inferior cirrus is small, and at the base of the foot. The bristles are colourless and really in two brushes, but the ventral brush is divided into two parcels, kept separate by the intervention of a lobule. The bristles of this brush are compound, the point being let into a deep cleft in the shaft, and shaped like a fine spear, being brought to a sharp edge on each side and terminated acutely. The bristles of the dorsal brush are longer, simple, tapered, slightly bent, and acute. To each brush there is a single spine. The anal segment has two short styles.

The specimen from which this description was made was fully a foot in length, but it was softened by long immersion in spirits. The greatest diameter was 4 lines. The proboscis was three-quarters of an inch in length ; the orifice without tentacular filaments ; nor could any jaws be discovered on a careful search. The number of annuli could not be reckoned, but an estimate made them not less than 240, each with its pair of feet. The head has no eyes, nor other appendage.

I have considered my specimen as identical with *G. Rouxii*, from the exact similarity of its feet to those of that species, as delineated by Audouin and M.-Edwards. I could, however, detect no jaws within the proboscis.

Obs. A large species, somewhat compressed, although convex on both surfaces. There is a median line down the back, and on the ventral surface there is a median space defined by an impressed line on each side. The feet are about the length of a quarter of the body's diameter. It is less highly coloured and iridescent than *G. mitis*. The figure of Blainville represents the specimen in the British Museum so well, that one is led to conjecture that it is the very specimen Blainville had from Dr. Leach.

(*a*) South Devon, *Mus. Leach.*

3. **G. capitata**, head not papillary at the rings ; segments biannulate, even ; setigerous branches of the foot coalesced into one large lobe with a pointed apex ; dorsal cirrus in the form of a small wart on the side above the basis of the foot. Length 2–3″. Plate XV. *a*. fig. 1–10.

Glycera alba, *Johnston in Ann. & Mag. Nat. Hist.* xv. 147. pl. 9. f. 1–10. *Williams, Rep. Brit. Assoc.* 1851, 172. pl. 2. f. 5, *and* 235. pl. 11. f. 61.

Glycera capitata, *Oerst. Annul. Dan. Dorsibr.* 44. tab. 7. f. 87, 88, 90–94, 96 & 99.
Nereis teres, *Dalyell, Pow. Creat.* ii. 144. pl. 20. f. 1, 2.
Nereis Sorex, *Leach, Mus.*

Hab. The littoral region, burrowing in sand.

Desc. Body vermiform, round, or rather somewhat flattened on the ventral surface, tapered anteriorly to a sharp point, less tapered at the tail, $2\frac{1}{2}$ inches long, smooth, indistinctly annular, of a yellowish-white colour, stained with the contents of the intestine, and marked with a red vessel down the back. Head cornute, the apex surmounted with four minute antennæ only visible with a magnifier. Proboscis very large, faintly striate in a longitudinal direction; the teeth brownish-black, corneous, falcate, divided into three processes at the base, inserted into a sort of tubercle forming a square round the plain oral aperture. Segments very narrow, equal and numerous. Feet papillary, obscurely biramous, obtuse, pointed above at the outer angle; the cirri short, the inferior almost obsolete: bristles colourless, jointed near the apex; the spines straight, setaceous, pellucid. Anal segment rounded, apodal, terminated with two minute styles, which are frequently cast off in the animal's struggles.

Worm about 2″ long, $1\frac{1}{2}$‴ broad, narrowed posteriorly, convex and nearly alike on both surfaces, of a uniform dirty-white colour, dusky about the head, which is cornute as usual. Proboscis clavate, very villose, armed with black jaws. Feet lobulate, alike; the upper lobe? large, conoidal, more prominent than the inferior, which is about half the size and apiculate; superior? lobe with a short cirrus not reaching to the point, and armed with two sets or fascicles of bristles kept asunder by the apex: bristles compound, bayonet-like, the top-piece often broken off, colourless; spine one to each lobe, setaceous, colourless.

Glycera capitata lives under stones, sometimes buried in the gravel or sand, but the worm never penetrates far below the surface. Its motions in the water and in the sand are slow, but when irritated the contortions of the body are violent, and it very often twists itself so as to form a short spiral column.

Savigny considers his *G. unicornis* to be identical with the *Nereis alba* of Müller. It is more probable, however, that the British species is the same as the Norwegian; the more especially as there is nothing in the description to create any doubts of their identity. The *G. unicornis* is remarkable for its want of jaws, affording a striking proof that organs of vast importance in the higher classes are here only of secondary consequence, and do not even afford a good generic character.

Obs. Of a yellowish-white colour, smooth, and indistinctly segmented, the segments narrow and numerous.

(*a*) South Devon, *G. Montagu.*
(*b*) Aberystwyth, *J. Henslow.*
(*c*) Holy Island, *Dr. Johnston.*

Plate XV. *a*. Fig. 1. *Glycera capitata*, natural size, and in a favourite

position. 2. The same, with the proboscis protruded. 3. The head magnified. 4. A view of the proboscis fully extruded. 5. The apex of the proboscis viewed in front to show the jaws. 6. Three views of a jaw detached and magnified. 7. A side-view of a foot from near the middle of the body slightly compressed. 8. A view of two feet from above. 9. A bristle highly magnified. 10. The tail magnified.

4. **G. nigripes**, the cornute head not papillary at the rings; segments with one or two rings; feet palmate, with three nearly equal pointed lobes, the setigerous coalesced, the apices of the lobes black; no superior cirrus distinct from the dorsal lobe. Length 2–3″; breadth 2″.

Nereis (Nephthys) hirsuta?, *Dalyell, Pow. Creat.* ii. 145. pl. 21. f. 1–3.

Hab. Shores of Scotland.

Desc. Worm scolopendra-like, slender, about 2 inches long and 2 lines in breadth, so distinctly annulose that specimens in spirits appear crenulate, of the usual yellowish-brown colour, dotted on the sides, especially behind, with dark specks from the black lobules of the feet. Head cornute, tilted back when the proboscis is protruded, the apex crowned with four small antennæ. Proboscis, when fully extruded, nearly half as long as the body, clavate, villose with close-set tufts of minute papillæ, which, being of equal size and height and arranged in series, cause the surface to appear neatly crenulate under a low magnifier. Jaws four, very black, strongly curved, not serrate, but with processes at the base and sides like those of *G. capitata*. The anterior feet are closely approximated, but they become more distant posteriorly, with one or two intermediate annulations. The feet are uniramous, divided palmately into three nearly equal acute lobes, the mid one rather most prominent; and between the lobes the bristles are protruded. The bristles are all slender, clear and smooth, gracefully curved, compound, the point tapered and very acute. On the posterior half of the body the feet become very prominent, with a cylindrical base divided into three unequal lobes, the superior more prominent than the others, and furnished with a cirrus not to be distinguished from the lobules organically. There is no cirrus on the anterior feet, except in the form of a small undeveloped lobule.

The blackness of the feet depends on the colour of the tips of the lobules. This character is usually distinctly marked, and is always most decided on the posterior feet. There are also a few black streaks at the base of the feet.

A number of the specimens I have seen have the posterior portion of the body distinguished from the anterior by being abruptly narrower and tail-like. This is probably a renovated portion in individuals that had been accidentally mutilated.

Obs. Of a pale yellowish-brown in spirits, and distinguished

readily by the black tips of the lobes of the feet. This character appears to be constant, and is most decided on the posterior portion of the body. There is generally a black spot over the base of the foot, or a few black streaks or specks.

(*a*) Scotland, *Lieut. Thomas, R.N.*
(*b*) Scotland, *Lieut. Thomas, R.N.*
(*c*) Scotland, *Lieut. Thomas, R.N.*

18. GONIADA.

Goniada, *Aud. & M.-Edw. Litt. de la France*, ii. 244.

Char. Body scolopendriform, the segments dimidiate: head cornute, with four small antennæ on the apex: tentacular cirri none: mouth inferior, with a large proboscis armed on the ventral side with two series of wedge-shaped (7) denticles: feet biramous; the bristles compound, with the terminal piece dovetailed to the shaft, and setaceous.

1. **G. maculata**, body compressed posteriorly; proboscis without jaws, the aperture plain; the middle and posterior feet much more developed than the anterior, the ventral branch acutely four-lobed; the spine a pale yellowish-brown. Length 4–6″; breadth $1\frac{1}{2}'''$.

Goniada maculata, *Oersted, Consp. Annul. Dan.* 33. f. 16, 23, 91, 95, 97 & 98. *Grube, Fam. Annel.* 60.

Hab. The littoral region.

Obs. This is very slender in comparison to its breadth. Oersted states the length to be 18 or 20 inches, and yet the extreme breadth is only a line and a half. The body is narrowed posteriorly and compressed, whereas the anterior third, also narrowed towards the head, is almost cylindrical; it is of a dirty dull green, with a dusky line across each segment, and the anterior segments especially are glowing with blue and green iridescence. The cornute head is obscurely annulated, and the antennæ are colourless. The surface of the proboscis is papillose, and the orifice is irregularly crenulate; but there are no jaws, and the ventral denticles did not seem to be regular in their arrangement or definite in their number. The rings are numerous and short, the first forty, or thereabouts, with small feet, which become crowded and much more protuberant on the after rings, and so continue proportionably to the very extremity. These feet are divided into four digitiform lobules, of which the middle ones are the most elongated and carry the bristles; and the lobules become very divergent, and are reflected at the points, on the hinder segments. The bristles are in two unequal fascicles, the smaller fascicle on the dorsal branch, and each with a spine of a pale yellow colour: the bristles themselves are colourless, very slender, bayonet-like, with a long sharp setaceous smooth point.

This fine worm has much the appearance, on a slight glance, of the *Phyllodoce viridis*. It reminds the helminthologist of the *Nereides* which have the appendages of the posterior feet compressed and expanded into lamellæ. My only specimen did not afford feet, from which a distinct idea of their form could be derived, having become softened in the spirits. Oersted describes them thus :— "Pinna utraque in anteriore corporis tereti parte in unam trilobam abbreviatam connata, in posteriore depressa vero pinnis duabus discretis elongatis, superiore subquadriloba, inferiore biloba, cirro inferiore nullo." The specific name is derived from a character which seems either to be inconstant, or removeable by the spirits in which the specimen is preserved. I find no trace of the spots on the segments, except an obscure one on the segments near the anal extremity.

(*a*) Scotland, *Dr. Greville.*

Fam. VIII. SYLLIDÆ.

Nereides Syllidiennes, *Savign. Syst. Annel.* 13.
Syllidæ, *Williams, Rep. Brit. Assoc.* 1851, 212, 233.
Syllidea, *Grube, Fam. Annel.* 60.

Char. Body scolopendriform, polypodous or myriapodous, often linear, the anal segment with two styles: head small, flattened, roundish, inclining to triangular, with frequently two inferior lateral lobules projecting beyond the front, giving it a bilobed character: antennæ three, posterior: eyes four or two: occipital segment with two pairs of tentacular cirri, between which there is sometimes a small tuft of bristles: mouth terminal or ventral, with a long cylindrical proboscis without jaws or marginal papillæ, but sometimes with a small point for boring: branchiæ none: feet uniramous, small, with a dorsal and ventral cirrus, and furnished with a spine, and with setaceous simple and compound bristles.

19. SYLLIS.

Syllis, *Savign. Syst. Annel.* 43. *Cuv. Règn. Anim.* iii. 203. *Lam. Anim. s. Vert.* v. 317. *Aud. & M.-Edw. Litt. de la France,* ii. 204. *Johnston in Ann. & Mag. Nat. Hist.* xv. 145. *Williams in ibid.* ser. 2, xii. 403.
Nereisyllis, *Blainv. in Dict. des Sc. nat.* lvii. 472.

Char. Head with two lobes projecting beyond the front, and making it appear more or less bilobed: eyes four: antennæ submoniliform, similar to the tentacular cirri: myriapodous, the foot with an elongated submoniliform superior cirrus, and with a short unjointed inferior cirrus.

1. **S. armillaris,** head cordate, about as broad as long, with two obtuse lobes in front; antennæ moniliform, prolonged beyond the lobes; eyes almost in a semicircle, the anterior pair widest apart; dorsal cirri moniliform, four times longer than the breadth of the body. Length 2″; breadth 1‴. Plate XV. *a.* figs. 1, 2.

Nereis armillaris, *Müll. Wurm.* 150. tab. 9. f. 1–5, copied in *Encyclop. Méthod. Vers,* pl. 55. f. 13–17. *Turt. Gmel.* iv. 86. *Bosc, Vers,* i. 168. *Blainv. Dict. cit.* lvii. *Atlas,* pl. fig. 2, cop. from *Müller.*

Syllis armillaris, *Johnston in Ann. & Mag. Nat. Hist.* xiii. 438, *and* xv. 145. pl. 9. f. 1, 2. *Oersted, Annul. Dan. Consp.* 24. f. 27, 90, 94; *Grœnl. Annul. Dorsibr.* 29, *and in Kroyer's Naturh. Tids.* 1842, 117.

Hab. The coralline region.

Desc. Animal of a pale yellowish-brown colour, dusked in some places from the earthy contents of the intestine, very slender, linear-elongate, tapered at the tail, somewhat compressed. Head distinct, small, deeply lobed in front; the lobes porrect, papillary, coalescent behind, but separated by a line from the antenniferous portion, which is rounded and slightly convex. Antennæ slightly tapered, submoniliform, the medial originating from the vertex and rather longer than the lateral. Eyes placed in a semicircle, the posterior pair more approximated than the anterior. Proboscis long, the outer portion shorter than the basal, smooth. Post-occipital segment not larger than the following, with two tentacular cirri on each side, the superior longer than the inferior, submoniliform. Segments very numerous, short, or about as broad as long. The foot obtuse, undivided, furnished with a single fascicle of colourless bristles, which are jointed and curved near the pointed apex; the spine conical, straight. Superior cirrus at least three times the breadth of the body in length, becoming gradually shorter near the tail, slightly tapered, submoniliform; inferior cirrus not projecting much beyond the foot, conical, undivided. Styles of the tail elongate.

Length 2 inches; breadth about a line.

This worm is not uncommon. The specimen figured was found among some shells and stones which had been brought up from deep water by the lines of the fishermen. It may be compared, so far as external appearance goes, with the subterranean *Geophilus*; its motion is moderately quick, and effected in the usual way.

To the *Syllis monilaris* of Savigny this species is evidently nearly allied, and indeed I find no characters to distinguish it excepting the deeply-lobed front, and the greater comparative elongation of the superior cirri, which, in the figure of *S. monilaris* given by Audouin and Edwards (*Hist. nat. du Litt. de la France,* ii. pl. 4 B. figs. 1–5), scarcely exceed the breadth of the body. By the same characters *S. armillaris* is separated from the *S. fulgurans.* I have no opportunity of comparing ours with figures of any of the other species of the genus indicated by Audouin and Edwards. Müller's figures of this species are very good.

Any one acquainted with Annelides will at once be led, from their

great development and form, to conjecture that the frontal lobes of this worm are analogous to the exterior antennæ of the *Nereides*; and it may be considered as giving support to the opinion of Blainville, who had come to this conclusion from the examination of species in which their development is much less remarkable, and where there was little coincidence in their figure*.

Obs. Of a pale yellowish-brown colour. The body tapers at the tail. The foot is obtuse, and furnished with a single fascicle of compound colourless bristles, the terminal piece short and falcate.

PLATE XV. A. Fig. 1. *Syllis armillaris*, natural size. 2. The same magnified. 2 *h*. The head more highly magnified.

2. **S. cornuta**, head longer than broad, with two much produced lobes in front; antennæ not produced beyond the lobes, moniliform; eyes in a semicircle behind, the anterior pair widest apart; dorsal cirri moniliform, not longer than the diameter of the body; ventral cirrus small and papillary. Length 1″.

Syllis cornuta, *H. Rathke in Act. Nov. Curios. Cæsar.* (1843) xx. 164. tab. 7. f. 12.

Hab. Oyster beds.

Obs. A specimen $\frac{7}{10}$ths of an inch in length had about 100 segments, and was of a pale straw-colour. Eyes minute. Antennæ and tentacular cirri nearly equal in length and of the same form. Dorsal cirrus upwards and downwards alternately. Tail with two moniliform styles. Bristles stout comparatively with a small falcate piece, ciliated on the inner edge, articulated to the incrassated and obliquely cut end of the shaft. After death the appendages become much more distinctly moniliform.—*F. D. Dyster.*

3. **S. prolifera**, head rounded and entire in front, without lobes; antennæ elongated, filiform, unjointed; eyes in a square; dorsal cirri about twice as long as the diameter of the body, very obscurely jointed; inferior cirrus small, conical. Length 6–8‴. Plate XV. A. figs. 3, 4.

Nereis prolifera, *Müll. Zool. Dan.* ii. 15. tab. 52. f. 5–9, copied in *Encyclop. Méthod. Vers*, pl. 56. f. 12–15, and in *Jones's Anim. Kingd.* 221. f. 95. *Turt. Gmel.* iv. 90. *Bosc, Vers*, i. 174. *Aud. & M.-Edw. in Ann. des Sc. nat.* xxix. 231, *and Hist. Litt. de la France*, ii. 209.
Nereisyllis prolifera, *Blainv. Dict.* lvii. 473.
Syllis prolifera, *Johnst. in Ann. & Mag. Nat. Hist.* xv. 146. pl. 9. f. 3, 4.
Autolytus prolifera, *Grube, Fam. Annel.* 62.

Hab. The coralline region.

Desc. Body rather more than half an inch in length, scolopendri-

* Dict. des Sc. Nat. lvii. 474.

form, roundish, of a yellowish-brown colour. Head small, distinct, rounded and entire in front, with four eyes placed in a square, the anterior pair more widely set than the posterior. Antennæ three, elongate, filiform, clothed with minute cilia, unjointed. Proboscis apparently without teeth or other armature. Segments numerous, narrow, incised at their junctions; the post-occipital with a pair of tentacular cirri on each side, one-half the length of the antennæ; the cirrus of the following segment elongate, antenniform. Feet uniramous, short, entire, armed with a single fascicle of retractile simple unjointed bristles. The superior cirrus longer than the breadth of the segments, obscurely marked with a few transverse lines or wrinkles, but not in any degree moniliform; the inferior cirrus small, and not projecting much beyond the foot. Tail tapered, tipped with a pair of styles.

Müller gave to this annelid the specific name *prolifera*, because he discovered that the worm could propagate itself by a spontaneous division of the body into two halves, the posterior half acquiring a head before it became separated. A worm in this condition resembled exactly two individuals jointed together, the one holding on to the hinder extremity of the other. Müller's discovery extended no further; and we are indebted to M. de Quatrefages for the completion of the wonder. From his researches it appears, that although the two halves, when the process of separation is completed, appear to be alike, and are so in all their external characters, yet otherwise they are essentially different. The anterior half—now an entire worm—continues to eat as before, and conduct itself as any independent annelid; but the individual formed by the posterior half is destined solely to the generation of its species. It does not eat; and its intestinal canal, having become unnecessary, wastes and is atrophied. As, however, the part contained the whole generative organs of the primary individual, the life of it is prolonged, by self-nutrition, long enough to permit these to mature the numerous ova; and by their dispersion, and evolution afterwards, the race is continued and multiplied*. The Myrianide discloses a more wonderful history, for of this beautiful worm the posterior half becomes self-divided into as many as six parts, each of them acquiring the cephalic appendages of the original before they take leave and separate themselves. In this condition the worm wanders about with a concatenated train behind of six big-bellied mothers, formed of its own tail in, apparently, a normal stage of development. These portions part in due time, —survive long enough for the maturation of the ova storehoused within them,—and then die in giving them birth†.

This little worm always kept its antennæ twisted up in a spiral manner, so that it was not easy to get a distinct view of their number and location: they differ remarkably from those of the preceding species in their greater development; and it was easy to see, with a magnifier of no high powers, that they were clothed throughout with fine cilia.

* Ann. des Sc. nat. i. 22 (1844).

† Milne-Edwards, Ann. des Sc. nat. iii. 170 (1845).

The *Syllis prolifera* is "more studious to divide than to unite." At a certain stage of its existence the body of the worm becomes strangulated in the middle, and divides into two after the first rings of the posterior segment have become so modified as to constitute a head. Müller has figured an individual in this condition. But M. de Quatrefages has made the additional and very singular discovery, that the two individuals are endowed with very different functions. The one that was the anterior half of the parent remains unchanged in its nature, and probably soon refurnishes itself with a tail; but the second, formed at the expense of the tail, is destined only to multiply the species! It becomes a uterine mother, and lays aside other duties. The alimentary canal tends to become atrophied, and the animal lives upon itself; but the generative organs develope, and produce the ova or spermatozoa which are to continue the species*.

Obs. Of a yellowish-brown colour. The antennæ are ciliated, and so twisted with the tentacular cirri that it is often difficult to ascertain their numbers and position.

PLATE XV. A. Fig. 3. *Syllis prolifera*, of the natural size. 4. The same magnified; 4 *h*. the head and anterior segments; 4 *s*. the middle segments; 4 *t*. the posterior extremity and styles.

4. **S.? monoceros**, head entire in front, furnished with an occipital antenna twice as long as the frontal; eyes four, quadrangular; dorsal cirri about twice as long as the diameter of the body, filiform, jointed. Length 8‴; breadth about 1″.

Nereis monoceros, *Dalyell, Pow. Creat.* ii. 157. pl. 22. f. 9–13.

Hab. Coast of Scotland: rare.

Desc. "Body nearly linear, subdivided into about 70 segments. A long antennular organ, somewhat of a moniliform appearance, issues from the centre of the anterior extremity, and the posterior extremity terminates in a long fork of two similar moniliform organs. Four red eyes, set in a quadrangle, occupy the upper surface of the head, from amidst which the single antennular organ distinctly originates. The site of a large proboscis is denoted by a white part near the anterior extremity. Three kinds of appendages belong to each segment; a large pencil consisting of a larger pencil of several very transparent, delicate, bristly hairs; also a shorter pencil, together with a fleshy spinous prolongation. This animal constructs a slight tube on the side of its vessel."—*Dalyell.*

I know two or three other British species of this genus, but I have not been able to describe them, from the ready facility with which they break up into fragments and cast off their mutilated appendages. The small species are beautifully phosphorescent. One of them Mr. Garner figures under the name of *Nereis phosphorescens*†.

* Ann. & Mag. Nat. Hist. xiii. 235; Ray Soc. Rep. Zool. 1847, 504.
† Trans. Zool. Soc. vol. ii. pt. ii. 99. pl. 20.

20. GATTIOLA.

Char. Body consisting of about fifteen segments, deeply indented at the sutures and narrowed in front: head small, flattened, rounded and entire in front, with three long filiform unjointed antennæ and two lobe-like processes on the occiput: eyes four, the pairs coalescent, so that there are apparently two only: tentacular cirri two pairs, similar to the antennæ: foot uniramous, the dorsal cirrus filiform and greatly elongated; the bristles compound, falcate: anal segment small, with two elongated styles.

1. **G. spectabilis.** Plate XVI. figs. 1–7.

Syllis tigrina, *Gosse, Icon. ined.*

Hab. The littoral region; on oyster-beds. Cullercoats, *A. Hancock and Jos. Alder.* Fowey, Cornwall, *C. W. Peach.* Tenby, *F. D. Dyster.* Ilfracombe, *P. H. Gosse.*

Desc. Worm scolopendriform, 6‴ in length, about 1‴ in breadth, rather convex dorsally and flattened beneath, consisting of fifteen nearly equal segments deeply indented at the sutures, rather shorter than their diameter, narrow in front, dilated behind on both sides where the feet originate, marked prettily with fuscous lines, forming a sort of square on the dorsum of every segment which challenges a comparison with some Hebrew letter. The anal segment is small, oblong, rounded behind, and terminated with two long setaceous styles. Feet protuberant, uniramous, furnished with a very long dorsal filiform cirrus, and with the ventral cirrus in the form of rather a large lanceolate lobe projecting beyond the setigerous lobe, which carries a fan-shaped fascicle of bristles; these are colourless, compound, the terminal piece falcate and smooth, or, under a high magnifier, denticulated at the tip.

The colour of living specimens appears to be cream-yellow or white, with its peculiar brown markings. Mr. Alder says, "The filaments were of a delicate rose-colour, and, when not extended, are curled in a beautiful spiral, like a Helix."—"My two specimens," says Mr. A. Hancock, "were taken under a stone between tide-marks at Cullercoats in September 1850. I kept them a little while alive. They were very beautiful creatures, and had a habit of curling their rosy tentacular filaments into regular compact spirals; and these they frequently clustered over the body so as almost to conceal it. At other times the filaments were thrown out perfectly straight, and extended even further than represented in the drawing; but on the least annoyance they were again gracefully coiled up, one after the other, and drawn close in to the body."—"When in repose," writes Mr. Dyster, "the superior tentacula-like cirri are curled closely at their extremities, and occasionally the creature rolls itself up in a ball with the ventral surface exposed, and the cirri totally contracted or rather contorted."

There are really four eyes, two on each side of the head, but the

pair are usually coalescent, and form a rather undefined reddish spot. "Posterior to the eyes, on the dorsal surface of the head, are placed two blunt processes of equal thickness throughout, which recline over the back, and are easily unobserved. The proboscis is short and barrel-shaped, without teeth; but there were two slender linear bodies, which appeared ligamentous in structure, implanted in the sides."—*F. D. Dyster.*

(*a*) Cullercoats, *A. Hancock and Jos. Alder.*

PLATE XVI. Fig. 1. Animal magnified. 2. Natural length. 3. Head, above. 4. Head, side of. 5. Mouth. 6. Foot, with cirrus and bundle of bristles. 7. Bristle magnified.

21. MYRIANIDA.

Myrianide, *M.-Edw. in Ann. des Sc. nat.* (1845) iii. 170 & 180.
Myrianida, *Grube, Fam. Annel.* 62.

Char. Head rounded in front without lobes: antennæ three, placed near the posterior line, somewhat clavate; tentacular cirri two pairs, similar to the antennæ: segments transverse, numerous: feet with a clavate dorsal cirrus, jointed at its insertion; the setigerous branch with a brush of compound falcate bristles: no ventral cirrus.

1. **M. pinnigera**, the segments white, transversely marked with yellow. Length $1\frac{1}{2}''$.

Nereis pinnigera, *Montagu in Linn. Trans.* ix. 111. tab. 6. f. 3. *Penn. Brit. Zool.* edit. 1812, iv. 95.

Hab. S. Coast of Devonshire, *Montagu.*

Desc. "Body long and slender, with numerous opake white joints transversely marked with yellow, and furnished at the sides with long flat appendages that flow over the back: tentacula scarcely distinguishable, unless the longer appendages in front be such: eyes four, chocolate colour. The posterior end suddenly decreases, and becomes very small, as if that part had been newly formed; a circumstance of no unreasonable conjecture, as it is well known that many of the Mollusca tribe are capable of reproduction."—*Montagu.*

22. IOIDA *.

Ioida, *Johnston in Ann. Nat. Hist.* iv. 231. *Oersted, Grœnl. Annul. Dorsibr.* 30.

Char. Body scolopendriform, with many segments: head small; eyes two, large; antennæ three, filiform, submoniliform: tentacular

* From Ἰοειδής, blue or violet-coloured. The name is given by Drayton to one of his Naiades:—

"Ioida, which preserves the azure violets."—*Polyolbion*, Song xx.

cirri none: feet uniramous, with a dorsal moniliform cirrus, a small setaceous ventral cirrus, and two brushes of bristles on the setigerous lobe: bristles compound, with the terminal piece falcate.

Obs. This new genus is allied to *Syllis*, from which it differs in the number of eyes, in the absence of tentacular cirri, and in the appendages to the feet; the *Syllis* having two cirri to each and a single bundle of bristles, while the *Ioida* has one cirrus and two bundles of bristles.

Perhaps the *Noctiluca marina* of Adler, in *Linn. Amœnit. Acad.* iii. p. 202. tab. 3, might be referred to this genus. It is only two lines long, and is a native of the Indian Ocean.

1. **I. macrophthalma.** Plate XIV. fig. 5.

Ioida macrophthalma, *Johnston in Ann. Nat. Hist.* iv. 231. pl. 7. f. 5.

Hab. The coralline region.

Desc. Worm about an inch long and a line in breadth, of a dark blue or purple colour, unspotted, linear-elongate, depressed, smooth. Head small, but very distinct, pale, rounded in front, entire. Eyes two, very large, lateral and nearly marginal, prominent, dark brown. Antennæ three, frontal, filiform, rather short, equal in size and equally distanced, porrect, faintly annular. Segments twenty-five in the specimen examined, distinct, broader than long, the post-occipital and anal considerably less than the others and with proportionably small appendages. Feet papillary, uniramous, each armed with a dorsal cirrus twice as long as the foot, obscurely moniliform, colourless, and with two bundles of bristles, the superior bundles consisting of short stout retractile bristles, jointed near the top, and with a spine in their middle; the inferior bundles of very long setaceous unjointed hairs, which the worm has no power of withdrawing. The first pair of feet is destitute of this inferior bundle. The anal extremity was wanting in the only specimen I have yet met with, but from the reparation which had begun, I believe it to be terminated by two styles similar to the dorsal cirrus.

PLATE XIV. Fig. 5. *Ioida macrophthalma.*

Fam. IX. AMYTIACEÆ.

AMYTIDEA, *Grube, Fam. Annel.* 63.

Char. Body vermiform or linear, more or less flattened, indented at the sutures, consisting of comparatively few segments. Head connate apparently with the post-occipital segment, with from four to eleven tentacular filaments (partly tentacula and partly tentacular cirri); and one or two pairs of eyes: mouth with a ventral aspect,

with or without a short proboscis, emaxillary: feet uniramous or biramous, with a dorsal cirrus, and frequently with very long bristles, which are setaceous, simple or compound.

There is but one native worm which has been referred to this family, viz. the

Nereis maculosa.

Nereis maculosa, *Montagu in Linn. Trans.* xi. 21. pl. 3. f. 4.

Desc. "Body linear, with about thirty pairs of fasciculate peduncles, complicated with a slender pencil of hairs above the broad fascicles, and in some points of view appearing like a single hair; above this issues a cirrus changeable in shape, but never longer than the peduncle, independent of the fasciculus: tentacula seven, the middle one largest, and placed in the centre of the forehead between the eyes, somewhat erect, and appears to be jointed: eyes four, black, the hindmost pair smallest, and not visible on the upper part; the others are large, and most conspicuous beneath: along the back are seven cordiform, equidistant yellow spots, the ground-colour white. Length about an inch. Rare. This is somewhat like *Nereis cornicula*, Müller, but the want of the bifid tentacula makes it distinct." —*Montagu.*

Fam. X. ARICIADÆ.

Nereiscolecia, *Blainv. Dict.* lvii. 485.

Ariciens, *Aud. & M.-Edw. in Ann. des Sc. nat.* xxix. 388; *Litt. de la France*, ii. 252.

Ariciadæ, *Johnston in Mag. Zool. & Bot.* ii. 63. *Williams in Rep. Brit. Assoc.* 1851, 199, *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 404.

Ariciæ, *Oersted, Ann. Dan. Consp.* 35.

Ariciea, *Grube, Fam. Annel.* 64.

Char. Body vermiform, roundish or depressed, of numerous short segments. Head small, often not distinguishable from the buccal segment, conical or rounded, often bilobed in front, exantennulate or with two elongated antennæ, with or without eyes, and, when present, they are small. Post-occipital segment apodous or with setigerous papillæ; in the latter case there are usually two remarkably long tentacular cirri inserted laterally or in the middle. Mouth directed ventrally, with or without a very short emaxillary proboscis. Feet divided into two branches, or rather there are two rows of setigerous tubercles on each side (four tubercles to every segment), not prominent in general, similar throughout or differing on some segments; the bristles simple and setaceous. Branchiæ none, or in the form of a setaceous or lanceolate filament reflected on the back, or elongated

and spreading, often clothed with large vibratile cilia. Miners in wet sand or mud, or dwellers in slightly cemented sand-formed tubes.

* With two long tentacula-like antennæ.

23. NERINE*.

Nerine, *Johnston in Mag. Zool. & Bot.* ii. 68 (1838). *Williams in Rep. Brit. Assoc.* 1851, 199, 213, 234, and f. 18. *Grube, Fam. Annel.* 66.

Char. Body vermiform, subquadrangular: head small, distinct: mouth subinferior, with a very short edentulous proboscis: eyes minute: antennæ two, occipital, large, long and tapered: branchiæ forming an uninterrupted series of short tapered ciliated filaments along each side, reflected on the back, with a lobe at their base: feet all alike, well developed, biramous, each branch consisting of a compressed lobe and a short pedicle armed with simple bristles: anus stellated with a circle of papillæ.

Obs. The body of the *Nerines* is elongated and vermiform, narrowed a little at the head, and tapered gradually towards the anal extremity; it is somewhat quadrangular, and is formed of numerous narrow segments. Each segment has on each side, affixed to its dorsal margin, a subulate branchial process, as long as the semidiameter of the animal, and of a fine red colour, which proceeds from two large blood-vessels running up within it. A cuticular fold or membrane invests the base of each branchial filament, and mounts along the side to an extent which varies with its position; for on the filaments of the anterior third of the body the membrane rises to the very apex and is comparatively broad, but posterior to this the point of the filament is free, and still further back the membrane gradually shortens until it at length is no longer to be traced,—the branchiæ at the same time becoming gradually less, and ultimately obsolete on the caudal segments (Pl. XVII. figs. 12, 5, 6, 13). When in water the branchiæ are raised and extended, and in almost constant movement; but when the worm is removed from the water, they are laid across the back, their points meeting in the middle, giving the body the appearance of being marked with transverse folds or elevated striæ. They are fringed on both margins with a single series of vibratile cilia, discoverable with a magnifier of common powers; but these cilia are deficient on the apex, as well as on the lobe, while they extend over the dorsal arch of the segments (fig. 3). The head is furnished with two large slightly tapering antennæ which originate from the occiput, and which are often cast off in the struggles of the animal: they consist of two large central vessels filled with red blood, and coated with a white mucous skin, which, when magnified, appears roughish or crenulate; and one side has a row of minute cilia, not, however, to be seen except with a good

* Nērīnē, a patronymic of the daughters of Nereus.

glass. The antennæ can be directed to any point, and are capable of being rolled up in a spiral form (fig. 11). There is a good deal of complexity in the structure of the feet, which renders their description and delineation difficult: they are lateral, and deeply divided into a dorsal and ventral branch, which is compressed, and armed with a series of retractile bristles of unequal lengths, and to each branch there is affixed a rounded plain compressed lobe, probably a modification of the cirrus of other Annelides. The bristles are simple, curved, and acutely pointed, those of the dorsal branch longer than those of the ventral, and there is a small fascicle of longer ones at the root of the branchial filament (fig. 3). The feet are apparently alike along each side until within a few segments of the tail, when the branchial filaments become very short or disappear, and the ventral branch seems to acquire a superior development, and to be armed also with longer bristles (fig. 4). The anus is dorsal in its aspect, and is surrounded with eight short equal papillæ, which assume a star-like form when the aperture is dilated.

The *Nerines* inhabit the sea-shore and the margins of rivers, a little below high-water mark. They prefer a soil composed of sand and mud, and in which the latter rather preponderates. They are found lurking under stones, or burrowing in the soil; and in the latter situations the surface to a great extent is seen full of small round perforations, and covered with little heaps of its tubular and spiral excrements. When disturbed, they descend in their furrows with great rapidity, and to a considerable depth; when taken, they throw themselves into violent contortions, as they "were waxed mad," during which the body generally separates into several portions, or loses its antennæ, which always separate at their very base. Their several portions retain their vitality for at least some days, which they evince not merely by their contortions when pricked, but even by moving from one place to another. The animals are named "Rag-worms" by the Berwickshire fishermen, and are used in their neighbourhood as bait to take the fry of the coal-fish.

This genus is evidently very different from any characterized by Audouin and Milne-Edwards. I have seen two species, of which the characters are:—

1. **N. vulgaris**, head obtuse and lunated in front; antennæ originating from the sides; anal papillæ eight. Length 4″; breadth 2‴. Plate XVII. figs. 1–8.

Spio vulgaris, *Johnston in Zool. Journ.* iii. 335 & 487.
Nerine vulgaris, *Johnston in Mag. Zool. & Bot.* ii. 70. pl. 2. f. 1–8. *Williams in Ann. & Mag. Nat. Hist.* ser. 2. xii. 408. pl. 14. f. 8. *Grube, Fam. Annel.* 66.
Nereis aries—Ram's-horn Nereis, *Dalyell, Pow. Creat.* ii. 148. pl. 20. f. 3–6.

Hab. The shore between tide-marks, ascending tidal rivers as far as the water is made brackish.

Desc. This worm is from 3 to 4 inches in length, of a yellow-

ish-brown colour, dusky in places from the contents of the intestine, and marked with red cross lines from the overlapping branchial filaments. The head is prolonged above the mouth into a sort of triangle, the base being outwards, and each angle prolonged into a short conical point somewhat contractile. There is a black spot on the vertex, and the bases of the tentacula are also stained with black, where the eyes, which are very small, are placed in pairs; but in several specimens I have not been able to detect these organs. The antennæ are rather more than half an inch long. The last ten segments appear to be defective in the branchiæ, and to have a more developed ventral foot and longer bristles than any of the others.

PLATE XVII. Fig. 1. *Nerine vulgaris*, of the natural size. 2. The anterior portion enlarged. 3. A view of a segment cut transversely. 4. The caudal extremity. 5. A branchial filament separate. 6. Another view of a branchia. 7. Bristles much magnified. 8. Oviform bodies.

2. **N. coniocephala**, head conical; antennæ originating on the vertex behind the eyes. Length 4–8″. Plate XVII. figs. 9–13.

Spio viridis, *Johnston in Zool. Journ.* iii. 486.
Nerine coniocephala, *Johnston in Mag. Zool. & Bot.* ii. 70. pl. 2. f. 9–13. *Grube, Fam. Annel.* 66.
Lumbricus cirratulus?, *D. Chiaje, Anim. s. Vert. Nap.* iv. 196. tab. 64. f. 16.
Spio coniocephala, *Williams, Rep. cit.* 170, 214. pl. 2. f. 1.
Nereine foliosa?, *Sars, Adriat. Havs Faun.* 15.
Nereis foliata—the Leaf Nereis, *Dalyell, Pow. Creat.* ii. 155. pl. 20. f. 11–18.

Hab. The shore.

Desc. Worm from 4 to 8 inches long, as thick when full-grown as the little finger of a boy, flattened dorsally, rounded on the ventral aspect, down the centre of which a blood-vessel runs from one extremity to the other, of a flesh-red colour anteriorly, but backwards the colour is usually a dull dirty green, with red lines and dusky blotches. Head conical, pointed like a snout, pale: proboscis very short, with a lobed orifice. Eyes four, minute, placed at the base of the antennæ in pairs, but apparently often wanting. Antennæ approximate at the base, from half an inch to an inch in length. Segments narrow, numerous; the filaments of the anterior fringed to the point with a broad membrane, those of the middle free and rather long, but becoming very short on the posterior. Feet much like those of the preceding, but proportionally less developed. Anus stellate.

This species inhabits our shores at low-water-mark, and is seldom found with the preceding, which loves a station higher up. It is rare that an entire specimen can be got, the animal breaking with ease into several portions, and throwing off its antennæ.

Obs. A larger species than the preceding, and usually tinged on

the anterior portion a dusky green, with red cross lines. Very fragile.

Dr. Williams mentions a *Nerine marcella, Rep. Brit. Assoc. cit.* 214, 234; and Sars queries whether his *Nerine foliosa* is synonymous with the "*Spio coniocephalus*, Johnst.," *Adriat. Havs Fauna*, p. 15. As there is no species with the latter name, we presume Sars means *Nerine coniocephala*.

PLATE XVII. Fig. 9. *Nerine coniocephala*, of the natural size, the tail wanting. The specimen was one of unusual size. 10. The proboscis. 11. An antenna magnified. 12. One-half of a cross section of an anterior segment. 13. A similar view of a segment from near the middle.

The following worm may belong to the genus :—

Nereis contorta.

Nereis contorta—the spiral Nereis, *Dalyell, Pow. Creat.* ii. 156. pl. 20. f. 19, 20.

Desc. "Length half an inch. Body round, slender, composed of numerous segments. Two large and long cartilaginous-looking antennæ on the head. A pencil of bristles issues from a papilla on each side of the segments, together with a spine of some length towards the back. No eyes could be discovered. This animal generally lies in so close a coil, that it is very difficult to ascertain its true figure, especially that of the posterior part, which has a short funnel-shaped margin."—*Dalyell.*—Is it *Leucodore cæca*?—See *Grube, Fam. Annel.* 67.

24. SPIO.

Spio, *Turt. Gmel.* iv. 81. *Mont. Test. Brit.* xxix. *Lam. An. s. Vert.* v. 318. *Blainv. in Dict. des Sc. nat.* lvii. 440. *Oersted, Annul. Dan. Consp.* 39; *Grœnl. Annul. Dorsibr.* 50.

Char. Body filiform: head subquadrangular or conical, with a central lobe produced in front: eyes four, in a square: antennæ two, sincipital, much elongated and cornuted: segments incised at their sutures, all nearly similar: feet prominent, furnished with a superior branchial cirrus, a shorter inferior cirrus, and with two setigerous tubercles,—the upper with setaceous and hooked bristles, the inferior with setaceous bristles only (No. XXXVI. figs. 1, 2, 3): branchial cirri undivided, flattened, reflected dorsally, veined and ciliated: anal segment with two short styles and a pair of inferior cirri. Tubicolous and arenicolous.

1. **Sp. filicornis**, the branchial cirri of the anterior segments largest, and gradually lessening on the posterior segments; antennæ

filiform, or somewhat narrowed towards the tips. Length 8‴; breadth $\frac{1}{2}$‴.

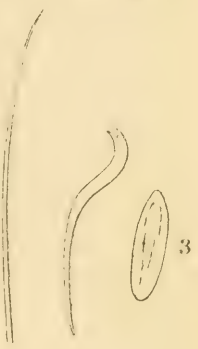
Nereis filicornis, *Müll. Zool. Dan. Prod.* no. 2640. *Fabric. Faun. Grœnl.* 307.

Spio filicornis, *Turt. Gmel.* iv. 81. *Lam. Anim. s. Vert.* v. 319; 2nde édit. v. 559. *Blainv. Dict. des Sc. nat.* lvii. 441. *Oersted, Annul. Dan. Consp.* 40; *Grœnl. Annul. Dorsibr.* 51.

Hab. The Laminarian region.

Desc. Worm rather compressed, narrowed backwards, of a yellowish-brown colour made dusky from the contents of the intestine, pale or colourless at both ends, where it is speckled with blackish dots, irregular in their position and form. Head quadrate, the central lobe bifid at the apex. Tentacula about one-fourth the length of the body, of a straw-yellow colour, cornute-like, crenulate, obtuse at the point. Eyes placed between the insertions of the tentacula, the anterior pair widest apart. Segments about thirty in a specimen 6‴ long, all nearly alike, the anal one apodous, terminated with two very short elliptical styles, and with a small obtuse lobe-like cirrus on each side; hence Oersted describes the tail as being quadrifurcate. Feet becoming gradually smaller on the segments backwards. Branchial cirrus of the anterior segments longer than the foot, and exceeding the diameter of the body, thick and flattened, obtuse and rounded at the apex, where there is a dusky spot; the surface clothed with vibratile cilia. The inferior cirrus is shorter, rounded, and lobe-like. The bristles (No. XXXVI. fig. 1) are all simple, and collected into fan-shaped fascicles; those of the superior fascicle are shorter and stouter, divided at the apex into two minute sharp claws (crotchets, fig. 2); those of the inferior numerous, very slender and setaceous.

No. XXXVI.
Spio filicornis.



1. Setaceous bristle.
2. Crotchets.
3. Elliptical bodies.

2. **Sp. seticornis**, the branchial cirri of the middle segments largest, disappearing towards each extremity; antennæ filiform; segments sixty-eight and upwards. Length 8–10‴; breadth $\frac{1}{2}$‴.

Altera Nereidum species, *Bast. Opusc. Subs.* ii. lib. ii. 134. pl. 12. f. 2.

Nereis seticornis, *Fabric. Faun. Grœnl.* 306.

Spio seticornis, *Turt. Gmel.* iv. 81; *Brit. Faun.* 137. *Penn. Brit. Zool.* edit. 1812, iv. 92. *Stark, Elem.* ii. 138. *Oersted, Annul. Dan. Consp.* 40; *Grœnl. Annul. Dorsibr.* 51. *Grube, Fam. Annel.* 66.

Hab. The littoral region.

Obs. The pairs of eyes are parallel. The segments are unspotted.

3. **Sp. crenaticornis**, central lobe of the head deeply bilobed; the branchial cirri about equal on all the segments; eyes with the posterior pair widest apart; antennæ tapered a little towards the tips; segments about sixty. Length 6‴.

Spio crenaticornis, *Montagu in Linn. Trans.* xi. 199. tab. 14. f. 6. *Grube, Fam. Annel.* 66.
Spio quadricornis, *Lam. Anim. s. Vert.* v. ; and 2nde édit. v. 559. *Stark, Elem.* ii. 138.

Hab. The coralline region.

Desc. "Body slender, much resembling that of a Nereis, tapering a little, and furnished with about sixty joints, terminating posteriorly with two short styles; the joints are furnished with peduncles and fasciculi; upon the upper part of the former are long cirri standing erect, with their points usually reflecting over the back, and nearly meeting those on the opposite side. The two tentacula are not quite filiform, but taper a little, and are articulated or furnished with numerous joints, which gives them a crenated appearance; their length is nearly half as long as the body: between the tentacula, but generally obscured by them, are four black eyes placed in pairs: on the front of the head is a short bifid snout, connected at the base." "The colour is pale, with pink cirri." "The tube or case in which these animals reside is extremely tender, composed of minute adventitious matter slightly agglutinated together: it is usually attached to *Sertularia*."—*Montagu.*

25. LEUCODORE*.

Leucodore, *Johnston in Mag. Zool. & Bot.* ii. 66. *Grube, Fam. Annel.* 67.
Leucodorum, *Oersted, Annul. Dan. Consp.* 38.

Char. Body vermiform: head conical, with two long occipital antennæ: first four segments with papillose setigerous feet, the fifth with spinets and apodous, the following with papillose feet like the anterior, and furnished besides with a branchial cirrus reflected on the back: anal segment campanulate, the vent opening in its concave centre. Tubicolous.

* Name from λευκὸς, white, and δῶς, a gift (and not δορὰ, the skin, as Agassiz gives it). The naturalist who has experienced the joys of finding a hitherto unseen animal, and to whom the pleasing duty has been reserved of publishing an additional illustration of the wisdom of his Creator, and of filling up a blank in our knowledge of His works, will at once divine the origin of this name so strangely applied to a worm:

"Nomen habes niveis nunc inscriptum ergo lapillis."

The scholar may remember that the name was originally formed by some classical wit for Dr. Whitgift, the famous Archbishop of Canterbury, temp. reg. Elizab. See Walton's Lives by Zouch, p. 209. York, 1807.

1. **L. ciliatus**, front obtusely bilobed; eyes four, between the antennæ; segments 40 to 50. Length 6–8‴. Plate XVIII. figs. 1–6.

Leucodore ciliatus, *Johnston in Mag. Zool. & Bot.* ii. 67. pl. 3. f. 1–6. *Williams, Rep. Brit. Assoc.* 1851, 206. *Grube, Fam. Annel.* 67.
Spio seticornis, *Blainv. Dict.* lvii. 441, *Atlas*, pl. fig. 2, copied in *Griffith's Cuv.* xiii. pl. 4. f. 2. *Aud. & M.-Edw. Litt. de la France*, ii. 289.
Leucodorum ciliatum, *Sars, Adriat. Havs Fauna*, 17. *Oersted, Annul. Dan. Consp.* 39. f. 104.
Diplotis hyalina, *Garner in Trans. Zool. Soc.* vol. ii. pt. ii. 99. pl. 20. f. 13.
Spio celata?, *Dalyell, Pow. Creat.* ii. 160. pl. 20. f. 21.

Hab. The littoral region near low water.

Desc. Worm from 6 to 8 lines long, linear-elongate, or slightly tapered to the tail, somewhat quadrangular, of a yellowish or flesh colour, with a dark red line down the middle. Head small, depressed, in the form of a short cylindrical proboscis, encircled with a raised hood or membrane. Mouth edentulous. Eyes four, minute, placed in a square at the base of the antennæ, which are more than a fifth of the length of the body, tapered, wrinkled, and clothed along their inferior sides with short cilia. Segments numerous, narrow, distinct, the first four with an inferior papillary cirrus on each side, and a brush of retractile bristles; the fifth with a series of bristles curved like an italic *f*, obtuse, not capable apparently of being protruded like the others, and having rather a more ventral position; the following segments have on each side an obtuse branchial cirrus originating from the dorsal margin, as long as half the diameter of the body, held either erect, or reflected across the back to meet its fellow on the mesial line; beneath it a small mammillary foot, armed with five or six sharp, slightly curved bristles of unequal lengths; under this a bundle of much smaller bristles (crotchets?), with a small conical cirrus with a still more ventral position. The branchial cirrus is clothed on its lower aspect with rather long moveable cilia; it becomes very small, or entirely disappears on the posterior segments, in which the bristles, on the contrary, appear to be longer and more developed. Bristles simple, unjointed. Anal segment conformed into a circular cup or sucker, in the centre of which the anus opens by a small round aperture.

In this worm the cilia, which cover the under sides of the branchial processes, are remarkable for their size and length, for they can be seen with a common magnifier fanning the water with equal and rapid beats, and driving the current along their surface. Their analogy with the cilia of Zoophytes is obvious; but here their motion is certainly dependent on the will of the animal, for I have repeatedly seen it begin and stop, and be again renewed after an interval of repose, and again be checked in a manner that could leave no doubt but that the play of the organs was entirely voluntary. The cilia of the antennæ, notwithstanding the larger size of the organs, are less than half the length of those of the branchiæ.

Leucodore ciliatus lives between the seams of slaty rocks near

low-water mark, burrowing in the fine soft mud which lines the fissures. Its motions are slow. When placed in a saucer, it keeps itself rolled up in an imperfectly circular manner, lying upon its side, and the painful efforts made to change its position, and with little or no success, show too plainly that it is not organized to creep about like the *Annelides errantes*, but, on the contrary, that its proper habitat must be a furrow similar to those of the Tubicolous worms, to which, in structure, it evidently approximates in several particulars.

Plate XVIII. Fig. 1. *Leucodore ciliatus* of the natural size. 2. The same magnified. 3. An antenna more highly magnified. 4. The bristles of the fifth segment. 5. A branchial process separated to show the cilia. 6. A few of the oviform bodies which lie between the intestine and skin.

** No tentacula-like antennæ.

26. EPHESIA.

Ephesia, *Rathke in Nov. Act. Acad. Nat. Curios.* xx. 176 (1843). *Ray Soc. Rep. Zool.* 1847, 507. *Grube, Fam. Annel.* 67.

Char. Lumbriciform; the head indistinct, conoid, without antennæ: tentacular cirri none: segments all similarly furnished with a single series of setigerous papillary feet, and with a parallel series above of globular mammillated warts: bristles simple, few, rather stout: anus terminal, without styles or papillæ.

1. **E. gracilis.** Length 2″; breadth $\frac{1}{2}$‴.

Ephesia gracilis, *Rathke in Nov. Act. Acad. Nat. Curios.* xx. 176. tab. 7. f. 5–8. *Grube, Fam. Annel.* 67.

Hab. The coralline region.

Desc. Worm lumbriciform, cylindrical, distinctly annular, beaded along the sides with a series of globular tubercles, of a uniform wood-brown colour, 2 inches long, and not a line in breadth. Anterior extremity narrowed, cylindrical, with an obtusely pointed apex, where there is an aperture, but no soft appendage or visible organ. Rings numerous, all alike, about equal in length and diameter, not contracted at the dissepiments, each furnished with a prominent white pearl-like mammilla, forming a series along each side, and beneath it a parallel series of less obvious obtuse setigerous papillæ or feet. The mammillæ are of a dense structure, exactly globular, but some of them have a very minute papilla on the top; they appear to be seated on a thickened portion of skin which connects them, as it were, together; and they seem to be immoveable, nor have any appearance of a branchial organ. The feet are simple, slightly prominent, obtuse, furnished each with four or five simple, rather stout bristles in a fascicle. Posterior extremity suddenly

narrowed into a short cylindrical tail, consisting of twelve very narrow rings, and with the anus on its rounded end. It has much the appearance of a part that has been lost and reproduced.

I have seen only one specimen, which I owe to the kind attention of Mr. Jenner. It is hard to say which is the anterior and which the posterior extremity, for the proboscis is retracted and invisible. The skin is furnished with very minute spinules, arranged in about four series around each ring; but it is difficult to see them except when the skin has been raised from the subjacent textures by the maceration; nor could I satisfy myself as to their constancy or nature.

The position of this worm is very disputable. Were it not for a proboscis, I should not hesitate to have placed the genus in the family Lumbricidæ.

Obs. The two specimens I have seen were dredged in the Firth of Forth. In spirits they are of a uniform wood-brown colour, and closely resemble an earthworm of like size.

(*a*) Firth of Forth, *Mr. Jenner and Lieut. Thomas, R.N.*

27. SPHÆRODORUM.

Sphærodorum, *Oersted, Annul. Dan. Consp.* 42 (1843).
Bebryce, *Johnston in W. Thompson's Rep. Brit. Assoc.* 1843, 273.
Pollicita, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 4 (1845).

Char. Body serpentiform: head rather indistinct, conoid, with short papillæ on the margin; eyes four: mouth inferior, with a large proboscis, naked at the orifice: segments numerous, similar; branchiæ in the form of a globular papillate tubercle over each foot, which is uniramous, furnished with simple spinets only: anal segment with a mammillary tubercle on each side.

I first conferred the name of *Bebryce* upon this genus, but finding that this had been previously used by Philippi, I was under the necessity of renaming my worm. The genus is nearly related to, if not identical with, *Ephesia* of Rathke.

The relations of this genus are rather obscure. To *Nephthys* and *Glycera* it may be considered to approximate in the rudimentary state of the antennæ; but in all other respects there is too great a dissimilarity to allow us to consider them as very nearly affined. The branchial tubercles over the feet might suggest a comparison with *Phyllodoce*, but there is no structural resemblance; the lamellæ in *Phyllodoce* being merely modifications of the superior cirrus, moveable and jointed at the base, and acting as a kind of oar in the animal's locomotion; while in *Pollicita* they are branchial only, being immoveable, and of no use or applicability as locomotive organs. The difference in internal structure is equally great, for in one genus the organs are veined with ramifications of the blood-vessels, while in this, the other, the structure is very distinctly areolar:

there can be no doubt that *Pollicita* is the same as *Sphærodorum* of Oersted, who has not been fortunate enough to see an individual extrude the proboscis.

1. **Sp. peripatus**, between each pair of the wart-like branchiæ two small papillæ. Length 2″. Plate XIV. figs. 1–6.

Bebryce peripatus, *Johnston in Rep. cit.* 273.
Pollicita peripatus, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 5. pl. 2. f. 1–6.
Nereis bullata—the Knob Nereis, *Dalyell, Pow. Creat.* ii. 147. pl. 22. f. 1–5.
Sphærodorum peripatus, *Grube, Fam. Annel.* 67.

Hab. The coralline region.

Desc. Worm about 2 inches long, very slender, narrowed towards both extremities, almost cylindrical, of the usual yellowish-brown colour, roughish. Head small, indistinctly separated from the following segment, longer than broad, rounded in front, where there are three unjointed antennæ, the medial nearly as long as the lateral: on the sides of the head there are besides a few minute fleshy papillæ, and the feet advance on each side rather before the eyes, which are placed unusually backwards. Eyes small, four, the anterior pair most approximate. Mouth inferior. Proboscis large, smooth, emandibulate, the orifice plain. Segments numerous, about the length of their own diameter, each of them furnished with a globose branchial tubercle on each side placed over and above the foot, immoveable, unjointed, smooth, with a small papillary tip. Feet about sixty pairs, one pair to every segment, conoid, uniramous, papillary, not projecting beyond the branchiæ when at rest, but capable of being protruded beyond them, armed with four or five bristles and a spine. The bristles simple, sharp, curved like a hedge-knife, retractile. The skin is covered with minute papillæ or granules, only visible under a high magnifier. Anal segment truncate, without styles, but on each side there is a mammillary foot, which is larger than the penultimate, and, like it, appears to be destitute of bristles.

The specific name of the worm was suggested by the resemblance it has to the *Peripatus juliformis* of the Rev. L. Guilding (*Zool. Journ.* ii. pl. 14). It is slow in its motions. In some positions, what appeared to be a minute antenna was visible on the top of the head, and such as our figure represents it; but I could not satisfy myself of its real nature, and the appearance may have been produced by a mere fold, or possibly by some refraction of the light. The areolated structure of the branchiæ seems to be peculiar; and a foot bristled with papillæ is a very rare formation among the *Annelides errantes*.

Our figures were taken from a specimen which was only 8 lines in length.

Obs. I am not satisfied that this is distinct from the *Sp. flavum* of Oersted, but I have not met with a specimen of *Sp. peripatus* since I became acquainted with the latter species. In one small

specimen of *Sp. peripatus* there were about 60 segments, in length about equal to their own diameter; whereas Oersted states that in *Sp. flavum* there are 150 segments, twice as broad as long. The other differences are comparatively trifling.

PLATE XIV. Fig. 1. *Sphærodorum peripatus* of the natural size. 2. The same highly magnified. 3. The anterior portion of the body from below, to show the position of the mouth and proboscis. 4. A few segments from near the middle of the body. 5. A single foot and branchiæ to show their structure. 6. Three of the branchial globes separate from the feet.

28. CIRRATULUS*.

Cirratulus, *Lam. Anim. s. Vert.* v. 300. *Aud. & M.-Edw. Litt. de la France*, ii. 268. *Blainv. Dict. cit.* lvii. 489. *Johnston in Mag. Zool. & Bot.* ii. 71. *Oersted, Annul. Dan. Consp.* 43. *Grube, Fam. Annel.* 67.

Char. Body vermiform, subcylindrical, the segments narrow and numerous: head conical, labriform: mouth inferior, with a very short proboscis: branchiæ in the form of long filiform tortuous filaments originating from the dorsal aspect, or from the margins, of the segments, the few first segments without any, the segment succeeding the abranchial having a transverse series of many crowded on the suture: feet small, forming a double series along each side: bristles of two kinds, setaceous: anus dorsad, terminal, simple.

1. **C. tentaculatus**, branchial filaments originating from the anterior margin of the seventh segment; the body filaments numerous throughout. Length 8–9″.

Terebella tentaculata, *Montagu in Linn. Trans.* ix. 110. pl. 6. f. 2, copied in *Encyclop. Brit.* xi. pl. 276. f. 4. *Penn. Brit. Zool.* edit. 1812, iv. 111.
Cirrhatulus Lamarckii, *Aud. & M.-Edw. Litt. de la France*, ii. 271. pl. 7. f. 1–4. *Williams, Rep. Brit. Assoc.* 1851, 200, 216 & 236.
Cirrhatula tentaculata, *Templeton in Loud. Mag. Nat. Hist.* ix. 234.
Cirrhatulus tentaculatus, *Fleming in Encyclop. Brit.* xi. 221; *Mag. Zool. & Bot.* ii. 73.

Hab. The littoral region.

Obs. Considerably larger than the following. The snout is marked across with a dusky line. From the coalition of the anterior segments it is difficult, in preserved specimens, to decide which one is the first branchial. Grube omits this character, to which Audouin and M.-Edwards appear to attach much importance. It must be remembered that lateral or scattered filaments are found on some segments anterior to the seventh.

* *Cirratulus*, formed from *cirratus*, curled.

The *Terebella tentaculata* of Montagu and the *Cirrhatulus Lamarckii* of Audouin and Milne-Edwards appear to be the same species. The figure of Montagu is sufficiently characteristic; and better, indeed, than that given in Sir John G. Dalyell's recent work. Criticisms adverse to our opinion, founded on the number of annulations in the snout, do not sway us, nor originate a halt; for in Montagu's time such a character was not looked for, nor deemed necessary to be delineated with exactness. Neither was his fair artist a naturalist. And, in fact, the segments of the snout are so corrugated that they simulate true annulations: and these observations are now verified by the examination of Montagu's own specimens.

(*a*) South Devon, *George Montagu*.

2. **C. borealis**, proper branchial filaments originating from the anterior margin of the fourth segment in a clustered transverse series; the body filaments comparatively few and scattered: a curved black line (a series of eyes?) on each side of the suture of the first segment. Length 4–6″. Plate XVIII. figs. 7–12.

Lumbricus marinus cirris longissimis, *Müll. Wurm.* 193.
Lumbricus cirratus, *Müll. Zool. Dan. Prod.* no. 2608. *Fabric. Faun. Grœnl.* 281. f. 5. *Dalyell, Pow. Creat.* ii. 133. pl. 18. f. 1–4.
Cirratulus borealis, *Lam. Anim. s. Vert.* v. 302; 2nde édit. v. 536. *Stark, Elem.* ii. 141. *Oersted, Annul. Dan. Consp.* 43; *Grœnl. Annul. Dorsibr.* 54; *Kroyer's Naturh. Tids.* 1842, 126. *Rathke in Nov. Act. Acad. Nat. Curios.* xx. 180. tab. 8. f. 16 & 17. *Grube, Fam. Annel.* 67.
Cirratulus fuscescens et C. flavescens, *Johnston in Jameson's Edin. Phil. Journ.* xiii. 219. *Blainv. Dict.* lvii. 490.
Cirratulus Medusa, *Johnston in Mag. Nat. Hist.* vi. 124. f. 13; *and in Mag. Zool. & Bot.* ii. 71. pl. 3. f. 7–12. *W. Thompson in Ann. & Mag. Nat. Hist.* xiii. 437.
Terebella Meleseti, *Leach, MSS. Brit. Mus.*

Hab. The littoral region.

Desc. Body from 3 to 6 and sometimes even 9 inches long, tapered a little towards each extremity, rather less than a quill in calibre;

No. XXXVII.—*Cirratulus borealis.*

the ventral surface flattened and furrowed down the centre, of a dirty

brown or yellowish colour, much stained from the internal viscera. Head somewhat flattened, biannular, small, naked, marked on each side with a curved black line, the two segments posterior to it without filaments or feet. Segments numerous, rather narrow; from the anterior margin of the fourth, which becomes suddenly larger, arises on each side, but dorsad, a bundle of filaments shorter, generally more tortuous and of a paler colour than the others, which arise from the sides of the following rings down about one-fifth of the length of the animal, and a few remote filaments are dispersed irregularly on the rest of the body. There are two rows of slightly protuberant small papillary feet on each side, with a considerable interval between the rows; each papilla armed with from three to six bristles; the bristles of the superior longer, slenderer, and more acutely pointed than those of the inferior, which are few in number, stout and curved near the apex: no spines. Anus terminal, forming a plain aperture with a dorsad aspect (No. XXXVII.).

C. borealis lurks under stones, in a somewhat muddy soil, in which it forms burrows similar to those of the earth-worm, and into which it retires slowly when disturbed. The filaments by which it is so remarkably distinguished, and which curl around it like as many parasitical worms, are the branchiæ, or organs through the medium of which the blood is exposed to the influence of the air, and fitted for the purposes of life. They take their rise from above the dorsal feet, some from the back itself, are about twenty in number on each side, tortuous or extended, unequal in their lengths, the shortest being placed anteriorly, but the gradation is not regular; and they are very easily removed by handling or by immersion in fresh water. They consist of a large central vessel carrying red blood, surrounded by a white gelatinous transparent membrane, and are consequently of a fine red colour; but this is liable to variation, for some, particularly the anterior bundles, are often quite white, and others, again, are occasionally spotted, as from a partial stagnation of the blood in them. When magnified they appear to be crenulated, but are not fringed with cilia. Messrs. Audouin and Milne-Edwards propose to restrict the term *branchiæ* to the paler kind which are inserted in fascicles on the margin of one of the anterior segments, and they call the scattered filaments *cirri*; but surely, their function and structure being acknowledged to be identical, a name expressive of any difference in either respect is liable to objection. They also describe the feet as composed of two branches, but this is a mere anatomical fiction, for there is really no common base and no bifurcation, the upper and lower papillæ being separate, and divided by a considerable interspace; and on the posterior segments these papillæ are so slightly protuberant as to be scarce perceptible. The bristles are of two kinds: from the superior papillæ there issue about six, three of them long and slender, and three shorter and comparatively stout,—all of them simple, unjointed, and acute. The bristles of the inferior papillæ vary from three to one only in the caudal segments, and they are all stout and curved like the italic letter *f*.

Obs. I willingly follow Oersted in the synonymy of this species,

as it may be presumed a Dane is the best interpreter of northern species. The figure of Fabricius is bad even for his period; and it has had the ill fortune to have been copied by Blainville (*Dict. des Sc. nat.* lvii., *Atlas*, pl. fig. 4) in an improved condition, misrepresenting the creature both in features and in manners.

(*a*) South Devon, *George Montagu.*

Plate XVIII. Fig. 7. *Cirratulus borealis* of the natural size. 8. Head and anterior segments much magnified. 9. A view of the mouth. 10. Transverse section of a segment from the posterior part of the body. 11. A side view of two segments from near the middle, showing the spines greatly magnified. 12. The tail.

29. DODECACERIA.

Dodecaceria, *Oersted, Annul. Dan. Consp.* 44.

Char. Body lumbriciform: head undefined, conical; the mouth subterminal: branchiæ filiform, a pair from the second and following segments to the sixth or seventh; none on the posterior segments: bristles in two separate series along each side, setaceous and uncinate.

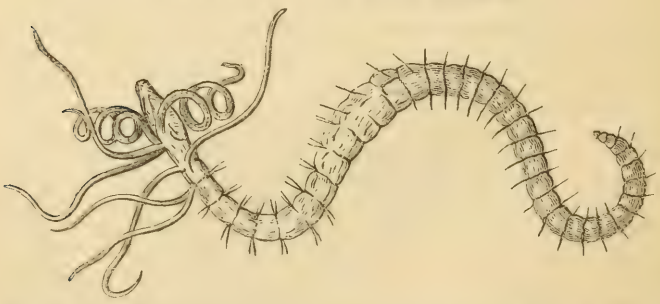
1. D. concharum.

Dodecaceria concharum, *Oersted, Annul. Dan. Consp.* 44. f. 99.
Cirratulus concharum, *Sars, Adriat. Havs Fauna*, 17. *Grube, Fam. Annel.* 68.
Terebella ostreæ, *Dalyell, Pow. Creat.* ii. 209. pl. 26. f. 10.

Hab. The coralline region. Lives in tortuous cylindrical holes which it has bored in the layers of bivalve shells.

Desc. Worm, when full-grown, about an inch long, and scarcely a line in diameter, somewhat bulged in the middle, about equal at both

No. XXXVIII.—*Dodecaceria concharum.*



ends, of a yellowish-brown colour, irregularly dusked, and marked

with a red mesial vessel most apparent on the anterior half. There is no head, but the first ring forms a sort of cylindrical obtuse snout, which is emandibulate and entirely without appendages; the mouth terminal. Eyes none. From the front margin of the following ring there arise a pair of proper tentacula, and a pair of tentacular filaments beneath them; and a pair of these filaments come also from the margin of the two or three succeeding rings. The proper tentacula are distinguished from the filaments by being a little larger, and more distinctly crenulate under the magnifier. They are all nearly of the same length, filiform, smooth, varying in colour from a rich brown to olive-green, but the tips are always dark. The rings are distinctly defined, the eight or nine anterior nearly as broad as long, forming a cylindrical portion, after which the body becomes rather abruptly swollen. This enlarged portion consists of about ten segments, and is followed by a hinder portion that is fully equal to one-half the length of the body, and of which the rings are numerous and narrow, and furnished with longer bristles. Anal segment rounded, apodous, and without appendages (No. XXXVIII.).

The bristles form two series along each side, viz. each ring has, on each side, a dorsal and a ventral fascicle of them. There are several bristles in each fascicle, and of two kinds,—a long, slender, flexible, setaceous kind, and the proper crochet or hooked kind. In the dorsal fascicle the setaceous bristles are most numerous and considerably elongated, intermingled with three or four hooked ones; and in the ventral fascicle the hooked bristles are a little stouter, four in number, but the setaceous are comparatively few, short, and weak.

The young have only the two proper tentacula, but in other respects they are like the adult. The long filaments are developed in succession, and apparently not always in pairs, for I have found one only in several very small individuals. The specimen from which our figure was taken had six filaments besides the tentacula; but in a larger specimen there were eight, and this is the greatest number I have observed*. The colour of the worm is variable, and I have seen it entirely cinereous; nor is the distinction into three portions, as I have described the body, to be always perceived. Like many other species of its class, it is capable of altering its form to a certain extent, and never retains any one for many minutes consecutively.

In its habits it is very interesting. It lives in a straight or slightly sinuous furrow, drilled in the thickness of the shell of *Cyprina Islandica*,—one of the most compact and hard shells of our seas. How the worm bores this solid calcareous substance I am not able to conjecture. There is nothing in the structure that indicates the means; and yet there cannot be a doubt that the tunnel is the worm's own work. Its fitness to the body, and the unquietness and helplessness of the creature out of it, would prove this, could any one who has seen the living animal entertain a doubt. When at rest under water, the worm protrudes the tentacula and filaments from

* Hence Oersted's conjecture, that a difference in the number of these filaments may constitute distinct species, is groundless.

the circular aperture of the furrow, which is plain, and on a level with the surface. The filaments are laid along the shell, and kept quiet, or moved about like independent worms; nor could I discover that the proper tentacula were used otherwise than the filaments. I never saw them capture any prey. The excrements are pushed out at the same aperture, and may be seen occasionally collected in small earthy pellets about the margin. They are, probably, moved along the ventral surface by a kind of intestinal motion, and by invisible ciliary currents.

The worm imparts to diluted spirits a fine sap-green colour.

(*a*) Berwick Bay, *Dr. Johnston.*

(*b*) Falmouth.

II. LIMIVORA.

Les Tubicoles, *Cuv. Règn. Anim.* iii. 189. *M.-Edwards, Elém. Zool.* 2de édit. ii. 224.

Tubicolæ, *Griff. Cuv.* xiii. 7.

Tubicola, *Jones, Anim. Kingd.* 189, 221.

Annelides sédentaires, *Lam. Anim. s. Vert.* v. 332.

Cephalobranchia, *Latr. Fam. Nat.* 241.

Serpulina, *Macleay in Ann. Nat. Hist.* iv. 385.

Heterocrisia, *Blainville in Dict. des Sc. nat.* lvii. 427.

Limivora, *Grube, Fam. Annel.* 29–69.

Arenicolidæ, *Johnston.*

Char. Worms distinctly annular, the rings dissimilar, and dividing the body into head, thorax and abdomen: head indistinctly defined, without eyes or antennæ, and the mouth without teeth or proboscis: thorax with stigmata encircled with short peculiar bristles: feet prominent, armed with bristles, which are always simple, and either setaceous or hooked: branchiæ well developed, various in form, labial or attached near the head, and independent of the feet: anal segment without styles.—Tubicolous and marine. The tube is calcareous, arenaceous, earthy, or membranous.

Food swallowed in a fluid form, mixed with mud.

Fam. XI. OPHELIACEÆ.

Opheliacea, *Grube, Fam. Annel.* 69.

Les Ophelies, *Cuv. Règn. Anim.* iii. 205. *Sars in Ann. Sci. Nat.* sér. 2. vii. 247.

Opheliadæ, *Williams in Rep. Brit. Assoc.* 1851, 236.

Char. Body semicylindrical, compressed laterally, the ventral surface flattened; or nearly cylindrical, fusiform, or rarely exactly

vermiform; segments limited, with plain sutures not indented on the sides, and divided into less defined rings; the vent generally encircled with papillæ: head undefined, continuous with the body, generally conical, with one or two papillæ in front which serve for antennæ: eyes none?: mouth ventral, transverse, with a very short globose or cup-like emandibulate proboscis: branches of the feet inconspicuous, the bristles in one or two series, simple and setaceous: branchiæ cirriform, rarely compound, placed along the sides in a single series towards the ventral aspect, usually absent on the anterior or posterior segments, and sometimes found only on the anterior ones.

30. OPHELIA.

Ophelia, *Savign. Syst. Annel.* 38. *Aud. & M.-Edwards, Litt. de la France*, ii. 264. *Blainville in Dict. cit.* lvii. 479. *Fleming in Encyclop. Brit.* edit. 7. xi. 221. *M.-Edwards in Lam. Anim. s. Vert.* 2de édit. v. 537. *Grube, Fam. Annel.* 70.
Ophelina, *Oersted, Annul. Dan. Consp.* 45. *Griffith's Cuv.* xiii. 24.

Char. Head undefined, pointed, with a depression on each side: bristles in one or two series, simple and setaceous: branchiæ cirriform, viz. a series of fleshy, simple, setaceous filaments: ventral surface flat, used as a foot, distinctly defined, muscular, equal in length to the body.

Obs. Savigny described the anterior for the anal extremity, and the ventral for the dorsal surface. The same error was committed by Audouin and Milne-Edwards. Sars was enabled to rectify the mistake by his observations on living individuals.

There is a slight resemblance in general form and appearance between *Ophelia* and the genus *Amphioxus* amongst fishes.

1. **O. acuminata**, body fusiform; snout tipped with a small globule; branchial cirri to all the segments; anal extremity spoon-shaped, with two small fusiform appendages in front of the vent. Length 2″.

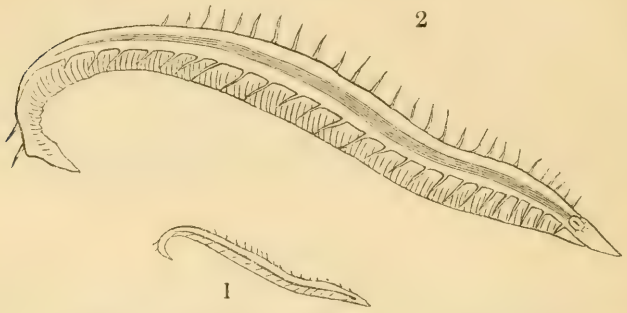
Ophelina acuminata, *Oersted, Annul. Dan. Consp.* 46.
Ammotrypane aulogaster, *Rathke in Nov. Act. Acad. Nat. Cur.* xx. 188 (1843), tab. 10. f. 1–3.
Ophelia aulogaster et Oph. acuminata, *Grube, Fam. Annel.* 70.

Hab. The laminarian and coralline regions.

Desc. Worm about 2 inches in length, rigid and fusiform, or tapering towards each end, the back rounded, smooth and even, with narrow segments divided by faintly marked lines, and of a uniform pearly colour; the ventral disk flattened, furrowed down the middle, of a cream-yellow colour, and separated from the dorsum by a rounded thickened line which runs along the sides, and along the upper rim

of which the feet are arranged in a single series. Head none. Anterior extremity pointed, with a small obtuse mucro. Mouth inferior,

No. XXXIX.—*Ophelia acuminata.*



1. Worm natural size. 2. Magnified.

about a line behind the snout, without a proboscis or jaws. Anal extremity curved, somewhat spoon-shaped, cartilaginous, and marked with transverse lines, and fringed beneath, on the margin, with a series of minute tentacular cirri. Feet about forty on each side, rather distant, and equally distanced, laid obliquely backwards, and appearing to be articulated to the body by a very slightly bulbous base. Each foot (No. XL. fig. 4) consists of a small papilla, whence issue two bundles of very unequal bristles, a greatly elongated superior cirrus, and a very short inferior cirrus in the form of a lobule. The superior cirrus

No. XL.—*Ophelia acuminata.*

3. Side of body and feet magnified. 4. Foot and bristle more magnified.

is tentacular, gently curved and tapered*. The bristles are all simple, very slender, slightly curved, very acute and smooth. The longest are much shorter than the superior cirrus. They form the inferior bundle; and the bristles of the superior bundle are comparatively short. There are no spines in either bundle.

The simplicity of this worm is an obstacle in the way of its

* What we have described as the superior cirrus, Oersted would consider to be the branchiæ.

description. It is difficult to decide which is the anterior, and which the anal extremity. I have been guided in my determination by the direction of the cirri, which I presume point backwards, and by the fact that I found the intestine near what I have called the tail, filled with a fine quartzose sand, while it was empty at the opposite end. By its form and rigidity it reminds one of the *Amphioxus*; and the distinct manner in which the dorsal is separated from the ventral disk, with the structure of the latter, calls up a comparison with a narrow Limax.

There is in some specimens a black speck on each side behind the snout, but it is uncertain whether these are eyes.

Rathke's figure exactly represents our specimens; and his description is probably superior to ours, from having been derived from living specimens. Unfortunately we have not been able to benefit from it.

(*a*) Cullercoats, Northumberland, *Jos. Alder*.

(*b*) Cullercoats, *Jos. Alder*: and Firth of Forth, *Lieut. Thomas, R.N.*

31. AMMOTRYPANE.

Ammotrypane, *Rathke in Nov. Act. Acad. Nat. Cur.* 1843, xx. 188. *Grube, Fam. Annel.* 70.

Char. Head continuous with the body, produced to a point: segments more or less ringed, the dorsal surface rounded, the ventral flat, but the limaciform sole abbreviated in front: branchiæ cirriform, in a single series on each side, connected with the feet of the posterior portion only: feet slightly protuberant, with two fan-shaped tufts of bristles: anus with a circle of small papillæ.

1. A. limacina.

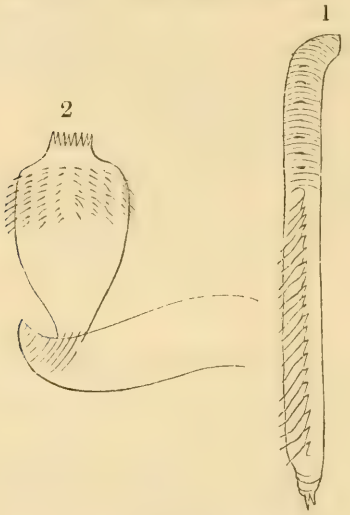
Ammotrypane limacina, *Rathke in lib. cit.* 190. tab. 10. f. 4–8. *Grube, Fam. Annel.* 70.
Ophelia eruciformis, *Johnston, MSS.*

Hab. Near low-water.

Desc. Worm $1\frac{1}{2}$–$2''$, thick proportionably, grub-like, smooth, very convex dorsally, with a thickened indented line along each side on which the feet are placed; the ventral surface flat, formed like the muscular foot of a gasteropod. The whole body is encircled with narrow slightly raised lines, which are most conspicuous on the anterior third, and less perceptible on the middle and posterior portions. The anterior portion consists of seven segments composed of three or four rings, and is distinguished by being conoidal, with less developed abranchial feet, and no ventral furrow. It is fully one-fourth the length of the entire body, becomes snout-like in front, and is terminated with a mucro. There is a short furrow on each side. Mouth large, inferior, transverse, with a thick lip; and a groove on each side bounds the soles of the whole anterior portion.

Anal extremity suddenly depressed and narrower; the vent terminal, encircled with a few short papillæ, and overshadowed with the tufts of bristles from each side. On the anterior portion there are six or

No. XLI.—*Ammotrypane limacina.*



1. Worm entire. 2. Proboscis exserted?

seven pairs of slightly developed feet, consisting of two minute lobules in a transverse line, between the clefts of which the small bundle of bristles is protruded. The other feet are alike, but are most developed posteriorly. There are about twenty-eight pairs (exclusive of the anterior), and each foot is furnished with two fan-shaped unequal bundles of bristles protruded from clefts between small rounded membranous lobules. The upper cleft has two lobules on each side, the under cleft one only; and above the upper cleft is the thick cirriform branchia, shorter than the bristles in specimens preserved in spirits. The superior fascicle of bristles is the longest and largest, and the bristles are all smooth, weak and setaceous.

Mr. Dyster thus describes it:—"Length $2\frac{1}{2}$ inches; breadth $\frac{5}{16}$ths. Anterior third cylindrical. Head conical; the remaining two-thirds somewhat compressed. Ventral surface divided deeply into two semicircular ridges, from the outer edge of which project the feet, carrying a bundle of longish setæ below, and prolonged above into filamentous branchiæ. The anterior one-third has about eight pairs of feet, resembling those of the *Rissulaceæ* (I speak only of appearance under a hand-glass; is not dissected yet). The four (?) caudal segments without appendages. Terminating in a circle (cluster?) of short stout conical papillæ. Segments very imperfectly marked; anteriorly not at all, but body transversely ringed. Very sluggish: gorgeously prismatic."

The worm is of a uniform pearl-colour. The motion is said to be very sluggish.

(*a*) Scotland, *Lieut. Thomas, R.N.*

32. TRAVISIA *.

Travisia, *Johnston in Ann. Nat. Hist.* iv. 373 (1840). *Grube, Fam. Annel.* 71.

Char. Body soft, vermiform, nearly alike on both dorsal and ventral surfaces, divided into an anterior and posterior portion: first segment produced into a small snout, and, as well as the second, apodous: mouth ventral, transverse: the following segments three-ringed, with two rows of fasciculated bristles along each side, and a simple cirriform branchial filament: posterior portion narrow, cylindrical, with two papillæ on each side of the segments, and a short cirriform filament between, with a single fascicle of bristles: penultimate segment apodous; the anal with a circle of small papillæ.

In 1840 I characterized this genus from specimens which were found in a collection of Scottish worms presented to me by Professors Goodsir and Edward Forbes. The specimens were not well preserved by the spirits, and most of them were entirely decomposed. I am now, therefore, inclined to believe that some of the external appendages may have fallen away; and that thus errors may have been committed in assigning the characters to the genus. These doubts as to my own accuracy have been raised by an examination of Sars's figures of his *Oligobranchus roseus*. That the worms are nearly related is very evident; but that they are synonymous cannot be concluded.

Sars's definition of his genus *Oligobranchus* is as follows:—"Corpus teres arenicoliforme cauda attenuata, segmentorum quodque ex annulis quatuor compositum. Caput distinctum, antice truncatum, tentaculis duobus brevibus; os subtus proboscide brevissima inerme; anus terminalis cirris quatuor. Pinnæ in segmento quoque utrinque duæ discretæ ex mammillis cum fasciculis setarum capillarium constantes, in segmentis anticis 14–15 absque appendicibus, in reliquis vero et cirro superiori et inferiori conico seu fusiformi ornatæ. Branchiarum arbusculæformium ramosissimarum paria quatuor in segmentis anticis corporis supra et pone pinnas in dorso."—*Fauna Litt. Norvegiæ*, i. 91. See also *Ann. & Mag. Nat. Hist.* xx. 348.

* Travisia, in commemoration of Mr. Travis, an eminent surgeon in Scarborough, and one of those "learned and ingenious friends" to whose correspondence Mr. Pennant was much indebted in preparing his 'British Zoology.' Is it *Ophelia* of Savigny? See Oersted's Grœnl. Annul. Dorsibr. 51. Kroyer's Naturh. Tids. 1842, 125.

1. **T. Forbesii.** Plate XIX. figs. 11–18.

Travesia Forbesii, *Johnston in Ann. Nat. Hist.* iv. 373. pl. 11. f. 11–18 (1840).
Ammotrypane œstroides, *H. Rathke in Nov. Act. Acad. Nat. Cur.* xx. 192 (1843), tab. 10. f. 9–12.
Ophelia mamillata, *Oersted, Annul. Dan. Consp.* 45 (1843); *Grœnl. Annul. Dorsibr.* 53. pl. 8. f. 103, 112, 114, 119, 120.
Travesia œstroides, *Grube, Fam. Annel.* 71.

Hab. The coralline region.

Desc. In figure this Annelide is something between that of the earth-worm and the leech: it is elliptical anteriorly, narrower and subcylindrical in the posterior half, of a uniform dull olive-green colour, smooth to the naked eye, distinctly annular. Both sides are so alike, that it is not easy to say at first which is the dorsal and which the ventral; but the anterior segments are so far unlike the posterior ones, that, to render the description more distinct, it may be advisable to consider it as divided into an anterior and a caudal half.

The anterior half consists of about fourteen segments, increasing gradually in diameter till near the middle, when they begin again to decrease a little. The first or cephalic segment is very small, pellucid, triangular, sharp-pointed like a snout, and somewhat concave underneath; it is destitute of every kind of appendage. The second segment is rather broad, and like the succeeding, excepting that it is single and without any armature. The other segments consist each of two, or sometimes three narrow rings; and each of them is furnished, on each side, with a dorsal brush of bristles, a long filament, a circular pore, and a ventral brush of bristles, similar to the dorsal, but smaller. On the secondary or intermediate rings there are no bristles, but one, two, or even three pores. The mouth is perforated between the third and fourth segments on the ventral surface; it is circular, with thickened puckered lips, edentulous, and without a proboscis.

The anterior segments pass by a sort of gradation into the caudal ones, though it is not difficult to mark the distinction. They are less in diameter, but broader in the opposite direction, and thickened on the sides, where there are two short obtuse fleshy papillæ. From the base, and below the dorsal papilla, the soft filament or cirrus originates, which does not exceed half the length of the anterior filaments. Close to the cirrus there is a brush of bristles, but I could not discover a second brush. There are thirteen of these caudal segments with a very narrow one between each: the last but one is small and unarmed, and the anal one is terminated with six soft obtuse papillæ, forming a sort of cup-like circle round the vent.

The skin of the worm, under a magnifier, appears to be granulated on the dorsal, and punctured on the ventral surface. The bristles are slender, unequal, slightly curved, acicular, smooth, and unjointed; they vary in number in the segments, but scarcely exceed twenty in any single fascicle, and are never fewer than four or five. Those of

the dorsal brush are longer than those of the ventral, but do not otherwise differ ; and both brushes come from the skin, and not from a papillose foot. There are no spines. The cirrus or branchial filament is soft and filiform.

It is necessary to observe that this description is drawn up from the examination of a single specimen, which had grown soft by maceration in the spirits, and was somewhat injured by the carriage. Thus the filaments or cirri of several segments were broken away ; and I ought to mention that there were no traces of any on the third, fourth and fifth segments. The specimen was rather more than an inch in length, but, from its structure, the worm is obviously capable of being elongated to a considerable extent.

PLATE XIX. Fig. 11. *Travisia Forbesii*, of the natural size. 12. The same, magnified. 13. The cephalic segments. 14. A side view of a segment from near the middle. 15. A view of a caudal segment on the dorsal aspect. 16. The same on the ventral aspect. 17. The anal segments. 18. A few bristles.

33. EUMENIA.

Eumenia, *Oersted, Annul. Dan. Consp.* 46. *Grube, Fam. Annel.* 71.

Char. Body subcylindrical or somewhat fusiform, composed of segments regularly decreasing on each side, each segment three-ringed : mouth inferior ; the anus terminal and without appendages : feet mammillate with fascicles of capillary bristles : branchiæ fasciculate, somewhat ramose, confined to the first six segments.

1. E. crassa.

Eumenia crassa, *Oersted, Wiegm. Arch.* 1844, 111. t. 3. f. 17, 20 ; *Annul. Dan. Consp.* 47.

Hab. The coralline region.

Desc. This is a very grub-like worm both in shape, size and colour. The body is divisible into three portions. The anterior is thick-skinned and wrinkled, distinctly annulated, the rings very narrow and composed of about three lesser ones, furnished on each side with two small mammillate setigerous feet merely separated by a deep line ; or, if we consider each ring to have one foot only, on each side, it may be described as biramous. There are fifteen or sixteen feet in this portion ; and on the first six rings, close to and above the feet, there is a small tuft of short curled filaments. There is no head, nor tentacular appendages. The mouth is subterminal, large, puckered, with minute spinules on the under edge. On the middle portion, distinguished by a thin serous skin stained with the contents of the intestine, the feet are similar but wider apart, and there are ten pairs on each side. The annulations are less distinct, and are occasionally obsolete. The tail portion is short, abruptly narrower,

rounded behind, thick-skinned and corrugated, with very narrow rings. There may be about ten pairs of feet on it. The anus is terminal and puckered, and without appendages. The bristles are alike on every foot; they are simple, slender and setaceous, and so long that I presume they cannot be entirely retractile.

The worm is a singular one. When Oersted says that it forms a link between the families *Ariciadæ* and *Arenicolidæ*, he means merely to speak of the character of the branchiæ. There is no similarity in form, nor in the structure of the skin; and there is a great dissimilarity in the ventral disk. Indeed, the form of this, its muscular structure, and its deep furrow, associate *Eumenia* with *Ophelina* and *Ophelia*, and is so discriminative, that these genera ought to be removed from *Ariciadæ*, and be formed into a separate group. This can be done only by a naturalist who has to take a survey of the class as a whole, and who is not restricted in his investigations to a single country.

The specimen described is about $1\frac{1}{4}$ inch long, thick and subcylindrical, nearly alike at both ends, which are obtuse. There is some irregular bulging in the body, which arises undoubtedly from contractions made in the agony of death. The colour is a dead white. The skin is smooth. The ventral surface is flattish and grooved.

(*a*) The Staples, *Lieut. Thomas, R.N.*

The "*Vermiculus crassus*" of Dalyell seems to be allied to this species. He describes the body as "thick, fleshy, smooth, round, tapering to each extremity, extending 21 lines by 4 in diameter. The mouth appeared to be a short slit, widening upwards below the anterior extremity; and what I was induced to consider as the opposite extremity was surrounded by a row of cylindrical fleshy spines of moderate length. The body, apparently round, has a flat narrow belly, whereon the animal crawls, like the narrow sole of the Doris, and of which the edges close and broaden in the same manner. Its cohesion is slight; the belly occupying about a fifth part of the circumference. The skin was smooth and uniform, without segments, or the least indications of them." Can swim on the surface of the water.—*Dalyell, Pow. Creat.* ii. 88. pl. 10. figs. 11, 12.

Fam. XII. SIPHONOSTOMACEÆ.

Chlorœmea = Chloremiens, *Quatrefages in Ann. des Sc. nat.* xii. 277–280 (1849).

Pherusea, *Grube, Fam. Annel.* 71.

Char. Body soft, vermiform, cylindraceous, with similar short segments: head defined or continuous, and, with one or two of the following segments, retractile into the anterior portion of the body, furnished with tentacular filaments: post-occipital segment armed with lateral tufts of bristles projecting forwards and often beyond the

tentacula: mouth anterior, without a proboscis: feet mostly biramous, the branches wide apart, the dorsal with simple or compound bristles, often curved at the tips: no crotchets: all the tentacular filaments on the head, a pair excepted, appear to be branchial.—Burrowers in mud.

34. SIPHONOSTOMA.

Syphostoma, *Cuv. Règ. Anim.* iii. 196. *Quatrefages in Ann. des Sc. nat.* xii. 286 (1849).
Siphonostoma, *H. Rathke in Nov. Act. Acad. Nat. Cur.* xx. 208 (1843).
Chloræma, *Quatrefages in lib. cit.* 281.
Siphonostomum, "*Otto*," *Grube, Fam. Annel.* 72.
Pherusa, *Oken.*
Lophiocephala, *Costa, Ann. Sci. nat.* xvi. 276.

Char. Head distinct, bitentaculate, almost hidden in the anterior tufts of long and numerous bristles; mouth subterminal, between the tentacula: body elongate, fusiform: dorsal branch of the foot with bristles only, the ventral with bristles and festucæ; and the foot furnished with numerous twisted hairs swollen at the apex, and enveloped in a transparent mucus.

1. **S. uncinata**, body cylindraceous; eyes 4; branches of the feet papillary, simple, with the intervening space even and straight.

Siphostoma uncinata, *Aud. & M.-Edw. Litt. de la France*, t. 9. f. 1; *in Cuv. Règ. Anim.* iii. 197; and illustr. edit. iii. *Annel.* 27. pl. 6. f. 4. *Quatrefages in Ann. des Sc. nat.* xii. 287 (1849).
Chloræma Edwardsii, *Dujard. Ann. Sci. nat.* xi. 288. t. 7. f. 1–5. *Quatrefages in loc. cit.* 286.
Siphonostomum Edwardsii, *Grube, Fam. Annel.* 72.

Hab. The shore near low-water.

(*a*) Tenby, S. Wales, *F. D. Dyster, Esq.*

35. TROPHONIA*.

Pherusa, *Blainville in Dict. des Sc. nat.* lvii. 440. *Quatrefages in Ann. des Sc. nat.* 3 sér. xii. 288 (1849).
Trophonia, *Cuv. Règ. Anim.* iii. 211. *Griffith's Cuv.* xiii. 30. *Johnston in Ann. Nat. Hist.* iv. 371.
Siphonostoma (part.), *H. Rathke in lib. s. cit.* 208 (1843).
Siphonostomum (part.), *Grube, Fam. Annel.* 72.

Char. Head indistinctly defined, with two tentacula and a tuft of

* The feminine of *Trophonius* it is presumed, although I nowhere learn that he had ever a wife. His cave might then have had less reputation for its silence. As the worm is an indifferent architect, the name is not very applicable. *Pherusa*, however, had been preoccupied by a crustacean insect; and when I proposed *Flemingia*, I did not, unfortunately, define the genus.

filiform tentacula-like branchiæ, the whole entirely retractile: mouth terminal: bristles of the anterior rings elongated, porrect, concealing the branchiæ more or less: feet alike, with simple dissimilar bristles on both branches: anus terminal and simple.

The *Trophonia* has a short membranous retractile proboscis furnished with two tentacula and eight filaments, which are supposed to be branchial. They are naturally flesh-coloured; but they often become of a bright grass-green, from the blood being forced into them by the motions or will of the creature. It can also inject this green blood into the tentacula, but, from their denser structure, they do not become thoroughly coloured by it. The tentacula are thicker than the branchial filaments, and somewhat annulated; and they are capable of being extended considerably beyond them.

The anterior portion of the worm is often bulged like that of the *Arenicola*. Its resemblance, both in outward figure and in motions, and in mutability of shape, to a *Holothuria*, e. g. to the *Holothuria inhærens* of Müller, is very remarkable. It was this resemblance that misled me first to describe the genus as a member of the family *Siphunculidæ*.

1. **T. plumosa**, body somewhat hispid, with about from fifty to sixty segments, granulous; bristles of the first three segments long and porrect; branchial filaments four on each side in two rows. Length 2–4″; breadth 3–5‴. Plate XIX. figs. 1–10.

Amphitrite plumosa, *Müll. Zool. Dan. Prod.* no. 2621. *Fabric. Faun. Grœnl.* 288. *Müll. Zool. Dan.* iii. 16. tab. 90. f. 1, 2. *Turt. Gmel.* iv. 83.
Pherusa Mülleri, *Blainv. Dict. des Sc. nat.* lvii. 440. *Quatrefages in Ann. cit.* 291.
Flemingia muricata, *Johnston in Trans. Berw. N. Club*, i. 15 (1832).
Flemingia plumosa, *Johnston in Ann. & Mag. N. Hist.* xvi. 447.
Trophonia Goodsirii, *Johnston in Ann. Nat. Hist.* iv. 371. pl. 11. f. 1–10. *W. Thompson in ibid.* xiii. 437. *Johnston in ibid.* xvii. 294.
Siphonostoma plumosum, *Rathke in Nov. Act. Acad. Nat. Cur.* 1843, xx. 208. tab. 11. f. 1, 2. *Ray Soc. Rep.* 1845, 283; and 1847, 508.
Pherusa Goodsiri, *Quatrefages in Ann. des Sc. nat.* xii. 290 (1849).
Siphonostomum plumosum, *Grube, Fam. Annel.* 73.

Hab. The laminarian and coralline regions.

Desc. Worm from 3 to 4 inches long, as thick as a swan's quill, distinctly annulated, tapering insensibly backwards to an obtuse point, subcylindrical, but so flaccid after maceration in spirits that the sides almost fall together, of a uniform earthy-brown colour or bluish underneath, rough with numerous granulations, which are somewhat larger on the dorsal than on the plane ventral surface. The cuticle or outer skin is easily separable from the body, which then appears of a dull leaden-blue colour, more or less iridescent.

Front armed with a brush of long hair-like finely iridescent bristles. Segments between 50 and 60, homologous, narrower than broad, granulous, somewhat puckered and thickened on the sides, on which there are two distant bundles of non-retractile bristles, but no papillose feet. First segment very small, and as it were drawn within the second: mouth subterminal, circular, edentulous. The second segment is rather less than the third, and from its anterior edge there originate, on each side, two brushes of long bristles that project forwards; similar but shorter brushes are borne by the third segment, and still shorter by the fourth, but still they are long enough to mix with those of the second to form that hairy brush which arms the front, and so remarkably characterizes the worm. The bristles of the other segments are not longer than the breadth of the body, and are either laid over the back or projected from the sides. These long bristles (figs. 6, 7) all belong to the dorsal brush, which consists of seven or eight, unequal in length, setaceous, smooth, slender and flexible, and closely annulated like the antenna of a Lobster or *Gammarus*: with them are intermixed a few much shorter acicular bristles that are not annulated (fig. 8): the bristles of the ventral brush are short and also of two kinds,—one kind setaceous and slender (fig. 10), the other stout, straight until near the extremity, where it is bent into a sharp cutting point: there are four or five of them in each brush (fig. 9). With a good magnifier we also discover that every one of the granules of the skin is tipped with a very short rather blunt spine. Anus terminal and simple.

From its softness and flaccidity, as well as from its structure, we may safely conclude that this worm burrows in the soil after the manner of the *Arenicola*, which it in fact resembles considerably. The brush of hairs on the anterior extremity will be in general protruded from the furrow, and is probably subservient to the capture of the prey. The hairs are, in all our specimens, soiled and infested with sordes and conferva-like filaments (fig. 6), which, though they could not be removed with a brush, are undoubtedly extraneous; but the hairs are not equally and alike so disfigured; for while some were almost clean, others were greatly loaded with this foulness, and none of it was found on the bristles of the lower segments.

(*a*) Berwick Bay, *Dr. Johnston*.
(*b*) Firth of Forth, *Lieut. Thomas, R.N.*
(*c*) Shetland, *Professors Goodsir and E. Forbes*.

PLATE XIX. Fig. 1. *Trophonia plumosa*, natural size. 2. The anterior segments from above; and 3. The same from below, magnified. 4. Three segments laid open by an incision through the ventral surface and spread out. 5. A portion of the skin highly magnified. 6. One of the front bristles. 7. A bristle from the dorsal brush of a segment from near the middle of the body. 8. Another bristle from the same. 9. A bristle of the ventral brush; and 10. One of the small ones that are associated with them.

Fam. XIII. TELETHUSÆ.

Telethusæ, *Savign. Syst. Annel.* 70 & 95. *Latr. Fam. Nat.* 244.
Paromocrisea, *Blainv. in Dict. cit.* lvii. 444.
Les Arenicoles, *Cuv. Règ. Anim.* iii. 197.
Arenicoliens, *Aud. & M.-Edw. Litt. de la France*, ii. 282.
Arenicolidæ, *Johnston in Loud. Mag. Nat. Hist.* viii. 566.
Telethusa, *Grube, Fam. Annel.* 74.

Char. Body vermiform, cylindrical, more or less inflated anteriorly, consisting of segments differently organized and formed of intermediate rings: head none; the first segment with a terminal circular mouth from which a short thick muricated proboscis is evolved: branchiæ arbuscular, attached at the base of the dorsal branch of the feet of a certain number of segments, for there are none on the anterior segments: feet similar, scarcely protuberant, biramous, the dorsal branch with capillary bristles only, the ventral formed by a series of crotchets.—Borers in sand.

The worms which constitute this small family are of the number of those which connect the *Annelides errantes* with the *A. tubicolæ*, their organization being of that undecided and commixed character which leads some naturalists to place them in the former order, and others, of equal authority, in the latter. Savigny, for example, arranges the *Telethusæ* among the *Serpulidæ*, a family of Tubicolans; but Cuvier makes them members of his *Dorsibranches*,—an order almost coequal with the *Errantes* of Audouin and Milne-Edwards.

The body of the *Telethusæ* is vermiform, cylindrical, and formed of comparatively few segments; but the segments themselves are annulated, or divided by a certain number of less decided circular plaits or rings. It is acephalous and obtusely pointed in front, truncate behind; and, for the sake of description, may be divided into three portions,—an anterior, which is generally inflated and always without branchiæ,—a middle, distinguished by carrying the branchiæ,—and a posterior, which is both apodous and abranchial. This part is absent in one of our species. At the apex of the anterior extremity we find the mouth, which is provided with a short thick edentulous proboscis roughened with conical fleshy papillæ: there are neither eyes, nor antennæ, nor cirri. The feet are all similar in structure, and consist of a dorsal branch garnished with proper bristles, and of a ventral ridge (scarcely perceptible on the anterior segments), surmounted with a series of imbedded hooked bristles*. The bristles are not smooth, but are feathered with spinules that are directed upwards to the point of the bristle†. Upon a certain num-

* Oersted, Ann. Dan. tab. 1. f. 13.

† See a figure by Oersted in his Consp. Annul. Dan. pl. 1. f. 1, but the spinules seem to be represented as mere denticles. Dr. Williams's figure is more correct.

ber of the middle and posterior segments are found highly developed vascular branchiæ, fixed, like scarlet miniature arbuscles, behind the dorsal branch of the foot.

The *Telethusæ* are called Lug-worms by our fishermen, and, in an economical sense, they are the most valuable and important members of their class. Almost at any season, when the tide has withdrawn itself within the limits of the ocean, the idler who has wandered down to the shore may, perchance, notice a group of men, girls and boys hieing thither with a glee that he might almost envy. Some carry a small spade, round and very sharp on the edge, and mounted with a long handle; and others have a little shallow bucket held by a twisted cord fixed in a hole on each side of the brim. They are a picturesque and a happy group. They go direct to a sandy bay which reaches from the shore to the lowest ebb, and is made a little sinuous by the ledge of rocks on each side that define its limits. Over this bay our group disperse themselves, every one as his experience guides him to the spot most favoured by the Lug-worm. Here, either directed by some peculiarity in the holes on the surface, or often, as I think, by mere guess, the bait-seeker plunges his spade deep into the sand,—not by pressure of the foot as a gardener does, but by the force of the arm only; and then he throws out the sand, whence his attendant boy or girl picks out the wreathing worm and tosses it into her bucket, the bottom of which has been just covered with a little sea-water. Thus the work goes on as if it were a pastime, until the whole bay has been searched, and now unseemly pits and hillocks cover the entire surface. But the tide flows fast,—and on its recess all is found to be again smooth and level, and no evidence remains to convict the spoilers of its tenantry.

This little bay—it may be 50 yards in breadth and four times that in length,—will afford daily a crop of worms for several successive weeks; and, after an interval of a month's rest, other crops of equal abundance; and this from year to year immemorial. To account for the unfailing supply, our fishermen imagine that the worms come in from the sea with the tides: more likely it is dependent on the fecundity of the species, and the rapid growth of the individual. The number taken is amazingly great. As a basis for the calculation let us take our own fishery, and let us estimate the boats engaged in the capture of fish that esteem the Lug-worm a favourite food at the number of twelve only (we have in reality seventeen so engaged at present),—and let us further suppose that each boat baits one line, with its 700 hooks, daily with the Lug, and for the short period of six weeks per annum, and this low estimate will give an annual consumption of 302,400 worms! Now again multiply this great host by the numbers used in each of the fisheries that are carried on in almost every bay and creek of our island, and it will take a very long series of figures indeed to express the enumeration, —such as sets the mind to wander vaguely amidst creations that are to it innumerable.

The manner in which the lob-worm burrows may be thus ex-

plained. An individual is laid by accident on the surface of the wet sand, and it wishes to bury itself underneath. The body is first disposed in an easy line; and then the anterior part moves of itself and swells out to an oval shape, pointed in front. The proboscis is now extruded, and a portion of the sand lying before it swallowed, so as to make a dimple in the surface. The bulged rings are now contracted, and the anterior, fashioned into a conical form, are thrust downwards by a successive series of muscular contractions, ring being pushed on after ring; for all the power is directed forwards by the animal, as the body is held steady, and hindered from being carried backwards by the protrusion and fixation of the bristles of the ventral series of feet. The anterior portion being in this manner buried, it is again dilated to the full, by which means the hole is enlarged, and the sand of the sides made more compact, and then this furrow is lined with a glutinous fluid exuded from the skin of the worm. Fixing again the buried part by the ventral feet, the same swallowing of sand and the same series of contractions are repeated; and thus the process is continued until the whole body becomes concealed in its mine*. It will be noted, that by the process of dilating the anterior part the calibre of the furrow is wider than is necessary to contain the body, but not wider than necessary to keep the branchiæ free from injury and friction as the worm moves rapidly up and down in the tube. These delicate organs can even be displayed in full, and perform their important functions at whatever depth the worm may descend; and partly to protect them, and partly to filter the water that bathes them, the brushes of bristles that overhang them are protruded amidst and above the vascular filaments, and every bristle is barbed or feathered with lateral spines†.

* From this account it is obvious that the worm lives in the hole with the head downwards. Mr. Osler omits the most singular part of the whole process in his account of the method of the Lug's boring, viz. the fact of its swallowing the sand immediately in front, and passing it through the intestinal canal. The worm "bores its way through the sand by means of the peculiar construction of the rings of its head, which, when elongated, has the shape of a regular cone. As each ring is so much smaller than the one behind it as to admit of being received within it, the whole head, when completely retracted, presents a flat surface. When this disk is applied to the sand, the animal, by gradually projecting the cone, and successively dilating the rings of which it is composed, opens for itself a passage through the sand, and then secures the sides of the passage from falling in by applying to them a glutinous cement, which exudes from its skin, and which unites the particles of sand into a kind of wall, or coating. This covering does not adhere to the body, but forms a detached coherent tube, within which the animal moves with perfect freedom, and which it leaves behind it as it progressively advances; so that the passage is kept pervious throughout its whole length by means of this lining, which may be compared to the brickwork of the shaft of a mine or tunnel."—Osler, quoted in Roget's Bridgewater Treatise, i. 278.

† Bellonius's history of this worm is a favourable specimen of his style, and is well done for his time. It is as follows:—"Lumbricus marinus, terrestri major, stabulatur in littore inter arenam, atque in eo potissimum tractu, quem æstus alti maris contegit: unde interdum discedens siccum relinquit. Piscatoribus ad escam plurimum confert, quem dum consectantur a recrementis, quæ more terrestris super arena relinquit, agnoscunt, quæ quo loco perceperint, eo pala ferrea impacta lumbricos e profundo extrahere solent, quos canistris in usum diligenter adservant. His natura ad excavandum humum mucorem in anteriore parte dedit,

36. ARENICOLA*.

Arenicola, *Savign. Syst. Annel.* 70 & 95. *Lam. Anim. s. Vert.* v. 335. *Schweigg. Handb.* 594. *Blainv. in Dict. des Sc. nat.* lvii. 446. *Leach in Supp. Encyclop. Brit.* i. 452. *Aud. & M.-Edw. Litt. de la France*, ii. 283. *Williams in Rep. Brit. Assoc.* 1851, 208; *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 398. *Grube, Fam. Annel.* 76.

Char. Body divided into three portions,—an anterior which is abranchial,—a middle which is branchiferous,—and a posterior which is both abranchial and apodous: capillary bristles spinulose; the crotchets with a single toothed apex.

1. **A. piscatorum**, branchial tufts 13 pairs, the first six segments setigerous only; the posterior portion naked. Length 10″.

Lumbricus marinus, *Rondel. De Aquatil.* lib. ii. 444. *Aldrov. De Insect.* lib. 7. 734. *Linn. Faun. Suec.* 2nd edit. 504; *Syst.* x. 648, and xii. 1077; *Amœn. Acad.* vii. 483; *Mus. Fred. Adolph.* 92. *Müll. Zool. Dan. Prod.* 215. no. 2609. *Fabric. Faun. Grœnl.* 279. *Penn. Brit. Zool.* iv. 34. pl. 19. f. 7; and edit. 1812, iv. 64. pl. 20. fig. med., copied in *Encyclop. Méth. Vers*, pl. 34. f. 16. *Turt. Gmel.* iv. 58. *Stew. Elem.* ii. 354. *Turt. Brit. Faun.* 128. *Home, Comp. Anat.* iv. pl. 40. f. 1–3. *D. Chiaje, Anim. s. Vert. Nap.* ii. 429. *Roget, Bridgew. Treat.* i. 277. f. 135. *Rathke in Zool. Dan.* iv. 39. pl. 155. f. B. 1–4. *Dalyell, Pow. Creat.* ii. 135. pl. 19. f. 1–3.

Lumbricus punctis prominulis, *Linn. Faun. Suec.* 364.

Vermis ex arena effossus Lug dictus, quo pro piscibus capiendis utuntur, *Sibb. Scot. Illustr.* ii. 3. 34.

The Sea-Worm, *Hill, Hist. Anim.* iii. 15.

Arenicola piscatorum, *Lam. Anim. s. Vert.* v. 336; 2de édit. v. 580. *Savign. Syst. Annel.* 96. *Aud. & M.-Edw. Litt. de la France*, ii. 285. pl. 8. f. 8–12; *from the Ann. des Sc. nat.* xxviii. 420. pl. 22. f. 8–12. *Edinb. Journ. Nat. and Geogr. Sc.* iii. 245. *Fleming in Encyclop. Brit.* edit. 7. xi. 219. pl. 275. f. 10. *Payraudeau, Annel. et Mollusq. de Corse*, 18. *Johnston in Loud. Mag. Nat. Hist.* viii. 567. *Guérin's Icon. du Règ. Anim.* pl. 4. f. 1. *Jones's Anim. Kingd.* 212. f. 87. *Oersted, Consp. Annul. Dan.* 47; *Grœnl. Annul. Dorsibr.* 55; *and in Kroyer's Naturh. Tids.* 1842, 126. *Williams in Rep. Brit. Assoc.* 1851, 171, 188, 195, 227, 248. f. 3, 10.

Arenicole des pêcheurs, *Cuv. Règ. Anim.* iii. 198; and *edit. illust. Annel.* pl. 1, and pl. 8. f. 1. *Bosc, Vers*, i. 190. pl. 6. f. 3. *Blainv. Dict.* lvii. 447, *Atlas*, pl. f. 1.

Arenicola tinctoria, *Leach in Mus. Brit.*; *and in Supp. Encycl. Brit.* i. 452. pl. 26.

Arenicola carbonaria, *Leach in Mus. Brit.*; *and in Supp. Encycl. Brit.* i. 452. *Savign. Syst. Annel.* 97.

Arenicola marina, *Templeton in Loud. Mag. Nat. Hist.* ix. 234.

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quem humi applicant: ex quo cum impetu spongiosum quidpiam egerit, quod evomuisse videtur: paulatimque in arenam subingressus, iterum in corpus regerit, quoad se totum arena contexerit, quod idem terrestri lumbrico accidere solet. Utrisque transversi branchi per ambitum insunt, quibus totam corpus molem contrahunt atque extendunt, ut ex pedali longitudine brevissimi, et fere orbiculares evadant. Verum marinus lumbricus teres est, pedem longus, digitum crassus, viscosus admodum, croceum colorem fundens, quo naves inficiuntur, qui etiam triduum perdurat. Villos in articulationibus pro pinnis habet: arena et limo vescitur."—*Bellonius.*

* From *arena*, sand, and *colo*, to dwell in.

Arenicole, *M.-Edw. Elem. Zool.* ii. 224. f. 720.
The Lug, *Penn. Brit. Zool.* iv. 34.
The Common Lug, *Drummond in Loud. Mag. Nat. Hist.* ii. 124.
The large Sand-Lob or Lugg-worm, *Stodart, Angl. Comp.* 109.

Hab. The littoral region, burrowing in sand, with a basis of dark soil formed of rotten sea-weed; preferring a station near low-water mark. The hole is about 2 feet in depth, and the presence of the worm is detected by the spiral rolls of sandy excrement coiled above the aperture for the tail; for these worms twist their "ropes of sand" with an ease which spirits might envy, and renew them after every reflux of every tide*.

Desc. Arenicola piscatorum is about 10 inches long, contractile, cylindrical, the anterior and branchial portions thick and mutable in form, the posterior suddenly narrower, varying in colour from a yellowish to an umber-brown, sometimes glossed with purple, sometimes dusky or black, the whole surface rough with small granules. Mouth reddish, puckered, with a short proboscis closely covered with papillæ; above the upper margin of the mouth, which projects a little, there is a small smooth somewhat triangular spot with a furrow in its middle. Segments 19, between the mouth and the last pair of branchiæ, as long as their own diameter, each consisting of five granulose rings separated by an impressed line, their own divisions marked by an elevated band very obvious when the worm contracts; first segment conoid, each of them furnished with a pair of setigerous feet protruding near the band of separation, the first pairs small, gradually enlarged on the other segments; the seventh pair with a small branchial tuft at its base, and every foot behind this has a similar but larger tuft. Branchiæ red or purple, arborescent, consisting of several principal branches, which are much divided, the divisions spreading, papillary. Bristles yellow, not very numerous, unequal, slightly curved towards the sharp point: underneath this setigerous foot there is a transverse fold, armed with a series of crotchets shaped like the italic letter *f*; they are few under the first pairs, but become more numerous under the branchial pairs, forming a ridge which meets its opposite on the mesial line. The tail is equal to the rest of the body in length, the segments indistinct, but often constricted at intervals, and sometimes so regularly, that it might almost be described as moniliform.

The intestine of the Lug-worm is always full of sand, from which it doubtless extracts the intermixed nutritive matter; and the colour of the body appears to depend on the nature of the ground the worm burrows in, and on which it feeds, being yellowish-brown when in pure sand, and very dark, or even coal-black, when the soil is miry

* "The formation of ropes of sand, according to popular tradition, was a work of such difficulty, that it was assigned by Michael Scot to a number of spirits, for which it was necessary for him to find some interminable employment."—Minstrelsy of the Scot. Border, iii. p. 253.

"They sifted the sand from the Nine-stane burn,
And shaped the ropes so curiouslie;
But the ropes would neither twist nor twine,
For Thomas true and his gramarye."—*Ibid.* p. 266.

and equally dark-coloured*. In Berwick Bay, specimens of both species, of all shades, occur. Vast numbers are daily dug up on all parts of the coast by the fishermen, who esteem them one of their best baits. They discharge, on handling, a liquor that imparts a yellow stain to the fingers, which it is difficult to remove. When the worms are steeped in spirits, they impart to the liquid a beautiful grass-green colour.

(*a*) No locality.
(*b*) Musselburgh, Firth of Forth, *Dr. Leach.*
(*c*) Black-rocks, Firth of Forth, *Dr. Leach.*
(*d*) Aberystwyth, *J. Henslow.*
(*e*) Little Hampton, *J. Abernethy.*
(*f*) Sandgate, *Rev. Geo. Smith.*
(*g*) Berwick Bay.

2. **A. branchialis**, the first 15 segments setigerous only; branchial tufts in 16–28 pairs; the posterior portion abranchial and apodous. Length 6″.

Arenicola branchialis, *Aud. & M.-Edw. Litt. de la France*, ii. 287. pl. 8. f. 13. *Grube, Fam. Annel.* 76.
Arenicola nodosa, *Leach in Brit. Mus.*
Arenicola Montagui, *Leach in Brit. Mus.*
Arenicola Dorvilliana, *Leach in Brit. Mus.*

Hab. The shore near low water.

Obs. There is no entire specimen in the collection. The species is less than the preceding, and all the specimens have assumed a black or blackish-green colour. The rings of the segments are very distinctly defined, and occasionally so deeply divided that the body is properly described as being nodulous. The variable number of the branchiæ appears remarkable, for in *A. piscatorum* it is fixed and uniform; and both species agree in having an abranchial tail.

(*a*) South Devon, *J. Cranch.*
(*b*) South Devon, *Dr. Leach.*
(*c*) South Devon, *Dr. Leach.*
(*d*) Falmouth.

3. **A. ecaudata**, branchial tufts more than 20 pairs; the first 14 or 15 pairs of feet abranchial; no tail. Length 6–8″.

Arenicola ecaudata, *Johnston in Loud. Mag. Nat. Hist.* viii. 566. f. 54.

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* "The diversity of colour in this species is very great; nor do I know that it is dependent on either age or dimensions. Of a number collected together, some will be found of a carmine colour, or of deeper red, some brownish, and others blackish-green; besides, there are specimens which exhibit various blending shades in the same individual."—Dalyell.

"La grande quantité de matière colorante de couleur safran que fournit l'*Arenicole*, avoit fait proposer de s'en servir pour la teinture; mais je n'ai point appris que cette proposition ait été suivie du moindre commencement d'exécution."—Blainville, Dict. des Sc. Nat. lvii. p. 390.

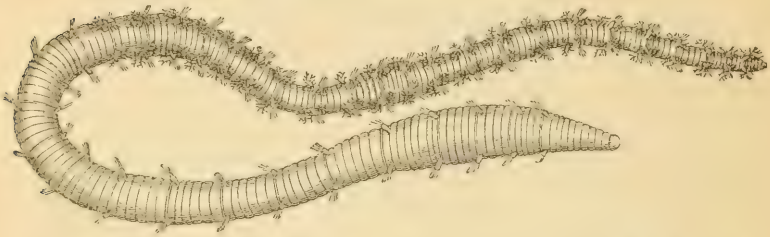
Arenicola Boeckii, *Rathke in Nov. Act. Acad. Nat. Cur.* xx. 181. tab. 8. f. 19–22.

Lumbricus marinus, another species, *Dalyell, Pow. Creat.* ii. 137. pl. 19. f. 4–6.

Hab. The littoral region, in sand.

Arenicola ecaudata (No. XLII.) is from 6 in. to 8 in. long, very contractile, minutely granular, of a yellowish-brown, tinted in many

No. XLII.—*Arenicola ecaudata.*



places with green and yellow, or sometimes very black, glossed with green. The primary rings seem to be composed of only four intermediate ones. The first fourteen or fifteen pairs of setigerous feet are destitute of branchiæ, but to every foot behind these there is appended a dark red arborescent branchial tuft: in one specimen there were twenty-two pairs, in another twenty-five; the first few pairs are smaller than those about the middle, whence they again decrease towards the tail. In other respects the structure is similar to that of *Arenicola piscatorum.*

Obs. Grube has suggested that the *A. ecaudata* may be identical with the preceding, and in support of this conjecture it may be remarked, that in both the first pair of branchiæ are attached to the same segment. In the few specimens I have seen, however, there was no appearance of an apodous portion, for the last segment, which was abranchial, had its pair of setigerous feet. This is confirmed by the description and figure of Sir J. G. Dalyell. The fewest number of pairs of branchiæ I have seen is 22 and 25; Dalyell's specimen had about 38; and Rathke introduces 40 into his specific character. It is evident, however, that the number depends on age and entirety; for as there is no development of a posterior portion, there is nothing, except maturity, to regulate the number of organs which are developed in succession.

Fam. XIV. MALDANIÆ.

Maldaniæ, *Savign. Syst. Annel.* 92.
Maldania, *Grube, Fam. Annel.* 76.

Char. Body vermiform, cylindrical; the segments rather long, more or less ringed, variable in size; the anal with a funnel-shaped

vent usually encircled with a crenate or papillose margin: head not distinctly defined, of the form of an oval plate lying upon the next segment, inclined forwards and without appendages; or ring-shaped and passing at the margin into a fimbriated membrane: post-occipital segment furnished with tufts of bristles: mouth directed forwards, edentulous: feet 2-rowed, the upper with thin tufts of bristles projecting from small and sometimes almost imperceptible tubercles; the inferior formed by a transverse series of crotchets: bristles simple, setaceous.

37. CLYMENE.

Clymene, *Savign. Syst. Annel.* 70, 92. *Grube, Fam. Annel.* 77.

Char. Head or anterior segment without appendages: anal segment expanded into a serrated funnel.

1. C. borealis.

C. borealis, *Dalyell, Pow. Creat.* ii. 255. pl. 35. f. 5.

Hab. Shores of Scotland, "not rare, dwelling in rocky clefts on the shore towards low-water."—*Dalyell.*

Desc. "It extends 3 inches in length, by about a line in thickness. The body consists of about twenty-four segments of irregular dimensions, some being twice the length of others, with a pencil of several bristles issuing from both sides of each. The extremity of the first segment dilates into a dental thin rim of from sixteen to twenty-four teeth, according to the specimen. These are somewhat extensile. The extremity of the last segment is obtuse and ovoid. The anterior extremity forms a very shallow funnel with the mouth in the centre; and there is a longitudinal groove or depression down some of the segments. This animal dwells in a compact, hard, irregular tube, constructed of sandy particles, united by an exudation apparently from the whole body, and fashioned chiefly during the night. The teeth of the funnel are probably instrumental in the work. It is extremely difficult, almost impracticable, to free the tenant of its tube without rupture of the body, or some great injury."—*Dalyell.*

It will be remarked that Sir John describes the anterior for the posterior end of the worm, which appears to be the *Sabella lumbricalis* of Otho Fabricius, *Faun. Grœnl.* 374 = Clymene lumbricalis, *Savign. Syst. Annel.* 94.

I have not seen a specimen.

Dr. Williams mentions as native a *Clymenoida arenicoida*, Rep. Brit. Assoc. 1851, 209 & 229; but I am not aware that he has anywhere defined the genus or described the species. The names are very objectionable.

Fam. XV. TEREBELLIDÆ.

Amphitrites, *De Montfort, Conchiol. Syst.* ii. 15.
Amphitrites térébelliennes, *Savign. Syst. Annel.* 69.
Terebellidæ, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 447.
Terebellæ, *Williams in Rep. Brit. Assoc.* 1851, 193–4, 206 & 266.
Terebellacea, *Grube, Fam. Annel.* 77.

Char. Body vermiform, cylindrical, generally inflated or thicker in front, the posterior portion of less diameter, and sometimes distinctly defined as a bristle-less appendage: head not defined nor separate from the buccal segment, furnished with numerous filiform extensile tentacula placed on the crown, or on a lobe above the mouth, or on each side near the mouth beneath the lobe: post-occipital segment, in some genera, armed on the dorsal margin with a transverse row of stiff golden bristles; and also with small lobes or cirri: mouth terminal, transverse, unarmed: setigerous tubercles of the segments almost always biserial, uniform in relative position, the dorsal with setaceous bristles, the ventral with a double or single series of hooks or uncini: on the posterior portion of the body the dorsal setæ, or both the dorsal and ventral, are frequently wanting: branchiæ much branched or pectinated, rarely filiform, placed laterally, rarely in the medio-dorsal line, confined to the two or three anterior segments.—Tubicolous, the tube arenaceous, open at both ends.

A. Front not armed with a row of stiff bristles.

38. TEREBELLA.

Terebella, *Montagu, Test. Brit.* xxx.; *and in Linn. Trans.* xii. 340. *Cuv. Règn. Anim.* iii. 193. *Lam. Anim. s. Vert.* v. 353. *Savign. Syst. Annel.* 69 & 83.

Char. Body elongate, ventricose anteriorly, strengthened underneath with a broad fleshy segmented band extended from the second to the fourteenth or an ulterior segment, where it terminates in a point; the part of the body posterior to the eighteenth or twentieth segment prolonged in a cylindrical tail composed of numerous segments, of which the three or four last form a short tube, folded underneath, and terminated by a plaited and circular vent. Mouth with two transverse lips, the upper prominent, vaulted, surmounted with numerous tentacula; the inferior narrow, plaited: tentacula very long, filiform, very extensile, furrowed below, and roughish with mucous granules: three anterior segments without appendages, or with anomalous ones; the first has sometimes two inferior semicircular leaflets contiguous at their base, separate at their tops, and

directed forwards; the second is always naked; but the third has occasionally appendages similar to the first, except in being separate at the base. Feet of the fourth and following segments of three kinds; first feet with a dorsal branch only with lance-shaped bristles; second pair and the succeeding, for a specific number, with a dorsal setigerous branch, and with a ventral branch consisting of a double series of hooks or uncini; the segments posterior to these with the ventral uncinated series only: branchiæ in one, two, or three pairs, inserted on the second, third, and fourth segments, near the base of the appendages when these exist, arbuscular. Tube membranous, coated with broken shell, gravel or sand, cylindrical, open at both ends, erect or free.

* Branchiæ in three pairs.

1. **T. conchilega**, branchiæ arborescent; setigerous feet 17 pairs, on a lateral thickened band; abdominal portion subannulose, with numerous uncinated papillary feet on equal and similar segments. Tube cylindrical, coated with fragments of shells, as thick as a quill. Length 6″.

Nereis conchilega, *Pall. Misc. Zool.* 131. tab. 8. f. 14–22.
Terebella conchilega, *Savign. Syst. Annel.* 85. *Grube, Fam. Annel.* 80.

Hab. The coralline or laminarian region.

Obs. Pallas says that the abdominal portion consists of as many as 150 segments, while Savigny tells us that the entire body has only 134, of which 114 belong to the abdomen. This difference does not indicate any difference in species, for, as a character, number of segments (as of tentacula and branchial filaments) is of no value, their evolution being successive, and consequently varying with the age and size of the individual. According to Savigny, the worm attains the length of 8 or 9 inches.

(*a*) No locality.

2. **T. littoralis**, branchiæ arborescent; setigerous feet 16 pairs, on a thickened base along each side; skin smooth, unspotted. Length 4–5″. Tube coated with sand or gravel, with a tuft of branched filaments around its upper orifice; buried erect. Length 6–12″.

Sabella chrysodon, *Mont. Test. Brit.* 546.
Terebella conchilega?, *Quatrefages in Cuv. Règn. Anim. illustr. Annel.* pl. 3. f. 1.
Terebella littoralis seu arenaria—the Sand Mason, *Dalyell, Pow. Creat.* ii. 183. pl. 26. f. 1–7.

Hab. Between tide-marks in bays, burying its tube in sand and mud mixed with gravel, the crested orifice raised about an inch above the surface.

Obs. The tube is as large or larger than a swan's quill, and is readily known by the singular tuft of branched arenaceous fibres with which the orifice is guarded. These are sometimes in two circles; for if, by accident, the first series is buried by a deposition of soil, the tenant constructs another, of higher elevation, to meet the contingency. Montagu says that the segments are "about forty, with as many fasciculi and branchiæ on each side, the first nine or ten much larger, and nearer together than those on the middle of the body; round the mouth are numerous long filiform tentacula, like the body, of a pale flesh-colour; behind the head are short branched feelers." Dalyell's description is little less vague; but he has given an interesting history of the worm's habits.

(*a*) Firth of Forth (the tube only).

3. **T. cirrata,** branchiæ arborescent, without appendages at the base; setigerous feet 16 pairs; "11 dorsal plates on the anterior articulations." Length 12″; breadth in front 6‴. Tube fragile, composed of sand and clay, immersed in the soil with half an inch projecting above the surface.

Buschigte Amphitrite, *Müll. Wurm.* 188. tab. 15.
Sabella cirrata, *Mont. Test. Brit.* 550. *Penn. Brit. Zool.* iv. 370 (1812). *Turt. Brit. Faun.* 203.
Terebella cirrhata, *Montagu in Linn. Trans.* xii. 342. tab. 12. f. 1. *Savign. Syst. Annel.* 86.

Hab. The littoral region: gregarious.

Obs. "Body long, with numerous orange-coloured articulations, furnished with small peduncles, and at the anterior end with fasciculi of bristles. Branchiæ large and red. Mouth with a frill-like membrane beneath, and ciliated above. Capillary appendages 4 or 5 inches in length."—*Montagu.*

Montagu's specimen in the Museum Collection is 10″ long, as thick as a man's finger forwards, tapered posteriorly, and terminated with a long cylindrical tail. The skin is smooth, and the colour has become a uniform grey or olive. The tentacula are numerous. The anterior pair of branchiæ are twice as large as the second, which again are larger than the third, and they are not furnished with appendages. The setigerous feet begin below the insertion of the hinder pair of branchiæ; and the yellow bristles issue from a cleft in a small papilla, forming a compressed brush. The uncini or hooklets form a linear-elliptical spot beneath each, and are disposed in a double series. But on the posterior portion of the body the hooklets define a roundish cup-like space with a raised margin; and these spaces become gradually very small as we follow them to the vent. The bristles are simple, very beautiful, with a cylindrical shaft brought to a double-edged sharp point like a lance; it is smooth. The uncini or hooklets are bent like a siphon, more acutely pointed at one end than at the other, and with a small obtuse knob near to, but unconnected with, the sharper end.

(*a*) South Devon, *G. Montagu.*

4. **T. nebulosa**, branchiæ arborescent, without lobe-like appendages; setigerous feet 23 pairs; dorsal surface of the anterior segments crenate and tessellated; "body spotted with white, having 13 dorsal plates." Length 6–7″; breadth 6‴. Tube "composed of slimy matter, covered with gravel and broken shells."

Terebella nebulosa, *Montagu in Linn. Trans.* xii. 343. tab. 12. f. 2. *M.-Edwards in Ann. des Sc. nat.* iii. 147 (1845), pl. 5, 6, 7 & 8, reproduced in *Voy. en Sicile*, i. 21. *Williams in Rep. Brit. Assoc.* 1851, 170, 183, *and in Ann. & Mag. Nat. Hist.* xii. 408. pl. 14. f. 1–3. *Quatrefages, Souven.* ii. 46.

Hab. The coralline region.

Desc. "Body long, orange-red, spotted all over with white. Anterior extremity very tumid, defended by the dorsal plates*; anterior peduncles very small, with the fasciculi pointed. The other peduncles and fasciculi are broad. The posterior end is abruptly smaller than the other, as if it had been lost by accident and afterwards reproduced. The capillary tentacula are numerous, and of a pale orange colour spotted with white. Branchiæ red, with white spots." —*Montagu.*

The spots disappear in preserved specimens. The anterior portion of a full-grown specimen is as thick as a man's little-finger, and tapers into the cylindrical tail consisting of numerous narrow segments. The dorsal half of the anterior segments is crenated on each margin, and wrinkled longitudinally so as to be divided into little squares,—a structure, perhaps, peculiar to the species. The numerous tentacula arise from above the upper lip, which is everted. The setigerous feet are proportionably small, and the lines formed by the uncini are linear-elongate, extending from the setigerous tubercle to the sternal band. The bristles and uncini present no peculiarity.

(*a*) Tenby, *Dr. J. Goodall.*
(*b*) Falmouth, *W. C. Cocks.*
(*c*) Berwick Bay, *Dr. Johnston.*

5. **T. gigantea**, "with 17 pairs of exserted fasciculi and 8 dorsal plates." Length 16″.

Terebella gigantea, *Montagu in Linn. Trans.* xii. 341. tab. 11.

Hab. "Inhabits the Devon coast, but is very rare."—*Montagu.*

Desc. "Body long, with numerous articulations furnished the whole length with peduncles, and a few with fasciculate bristles; but the seventeen anterior joints have the fasciculi most conspicuous, being always erected, and remaining so after death: the first eight joints have a broad plate on the back, different in structure from the rest; they are of a rufous-brown colour, shaded with purplish-black,

* By "dorsal plates" Montagu means the segments of the sternal or abdominal band, mistaking the ventral for the dorsal surface.

continuing down the back in a decreasing line. The general colour of the other parts is yellowish. Beyond the first seventeen joints the peduncles are very small, and appear to be destitute of fasciculi; and they incline gradually from the sides to the back, till towards the extremity they almost meet, forming two dorsal lines. Near the mouth originate numerous capillary appendages, that are 5 or 6 inches in length; the three pair of branchiæ are much ramified and red."—"*T. gigantea* is the largest of the discovered species; it inhabits the soil at the bottom of the sea, and seems to be destitute of any case. We found one specimen in the estuary of Kingsbridge at low water; it discharged an orange-coloured fluid from its mouth in great abundance."—*Montagu*.

6. **T. constrictor**, branchiæ arbuscular; setigerous feet 17 pairs; body orange-red, unspotted; sternal band with about 14 segments not narrowing posteriorly. Length 3–4″. Tube cylindrical, composed of mud, fragile, horizontal. Diam. 4–6‴.

Terebella constrictor, *Montagu in Linn. Trans.* xii. 343. tab. 13. f. 1.
Terebella figulus, *Dalyell, Pow. Creat.* ii. 191. pl. 27. f. 1, 2, and pl. 28. f. 1, 2.

Hab. The coralline region.

Obs. "Body orange-red, with about 120 approximate articulations furnished with small fasciculi."—*Montagu*. The branchiæ are rather small and arbuscular, with somewhat secund divisions inclined inwards. The tentacula are few and unspotted, capable of being extended to a greater length than the body. The head is pale, without any peculiar appendage, but marked behind the margin with a dark transverse line, composed, apparently, of minute dots. The orange colour of the body is best defined on the ventral aspect. The sternal belt is white, composed of about seventeen narrow transverse segments, which are not narrower posteriorly. Phosphorescent.

Montagu says, "Its case or tube is unknown." Sir J. G. Dalyell says, "Where circumstances allow, it selects soft mud or clay exclusively for the materials of its dwelling, which also is fashioned of a tubular form, heavy, thick and clumsy." The specimen under observation was found detached from its tube, nor could I appropriate any one of the many in the basin to it; it had lost the greater part of the abdominal portion.

(*a*) Berwick Bay, *Dr. Johnston*.
(*b*) Barmouth, Merionethshire, *C. Stokes*.
(*c*) No locality.

7. **T. venustula**, "with orange-red body, thickly and minutely marked with white spots." Length 3–4″.

Terebella venustula, *Montagu in Linn. Trans.* xii. 344. pl. 13. f. 2.

Hab. The coralline region, in old shells.

Desc. "First seventeen or eighteen joints furnished with short peduncles and fasciculi; other joints with long peduncles and no visible bristles. Capillary appendages whitish, very slender, numerous, and nearly double the length of the body. We have observed this animal fixing its tentacula, and by contracting them drawing its body forwards."—*Montagu.*

8. **T. tuberculata**, branchiæ arbuscular; body reddish-brown, speckled with white tubercles. Tube of fine sand. Length 5″.

Terebella tuberculata, *Dalyell, Pow. Creat.* ii. 197. pl. 29. f. 1, 2, and pl. 26. f. 8.

Hab. The coralline region, rare. Shetland, *Dalyell.*

Desc. "The body extends about 5 inches; and it is provided with about seventy long and strong tentacula, stretching 9 inches, which are capable of sweeping an area 18 inches in diameter around the head, while the body remains stationary. Six branchiæ are disposed in three pairs, the highest pair the longest, the other two successively decreasing. These are fine and florid organs, of peculiar formation, appearing somewhat mottled like birch bark under the microscope. These parts are alike numerous as those of the others, but they do not abound in similar curvatures; their extremities terminate in forks like thorns. Thirteen transverse furrows indent the upper portion of the body, which is subdivided into numerous annulations, and tapering down towards the lower extremity. As the animal extends its body, the annulations of the upper portion are quite obliterated. The whole is of a fine reddish-brown colour, the surface universally speckled with low white tubercles, rendering it altogether a very beautiful object.

"This *Terebella* constructs a wide loose case of fine sand, so large that it can reverse itself within, and sometimes the tentacula are seen protruding from both orifices. At first, from its general resemblance to the *T. figulus*, I thought it might construct a tube of mud or clay; but it testified no disposition to work in either, though employing some fragments of comminuted shell along with the sand. Night is the season of its greatest activity."—*Dalyell.*

** Branchiæ in two pairs.

9. **T. textrix**, body covered with a cobweb; pale, unspotted; the setigerous feet coequal with the number of segments.

Terebella textrix—the Weaver, *Dalyell, Pow. Creat.* ii. 206. pl. 28. f. 15–18.

Hab. Shores of Scotland, rare, *Dalyell.*

Obs. "Length of one specimen 6 lines, of another 9, of a third 12. The first had twenty-five tentacula, extending an inch, and a pair of ramified red branchiæ on each side, with a stump behind

each. The third species (specimen) had forty tentacula, but these organs totally intercepted the view of the branchiæ.

"This species constructs a semicylindrical sheath of sandy or muddy particles, which is always of insufficient dimensions to cover the body, or to receive the head. None of any other form has been seen. This sheath is frequently abandoned and as often resumed; neither does the animal restrict itself to the construction of one sheath only.

"A peculiar feature in its history is its producing a real cobweb, as distinct as that of the spider, with which it covers itself, and which also frequently, if not always, serves to support its spawn. The texture is very thin, rather irregular, and composed of the finest threads, almost invisible from their slenderness and extreme transparence. Neither the mode of formation or extension, nor the expedients for securing their extremities are obvious. Such a web, from the specimen 9 lines long, covered an area 15 lines square. This is plainly a work of some exertion, as the threads, sometimes amounting to fifty, are fixed to the side of the vessel as high above the bottom as equals the length of the weaver, or more, and they also extend below, there to be secured. Thus it is evidently an artificial work, and it receives successive accessions. The specimen continued its work about three weeks in May, but although surviving a month longer, it wove no more."—*Dalyell.*

*** Branchiæ one pair only.

10. **T. maculata**, body mottled with variegated colours, wherein brown, green and yellow predominate. Length $1\frac{1}{2}''$; breadth $1'''$.

Terebella maculata—the Spotted Terebella, *Dalyell, Pow. Creat.* ii. 203. pl. 28. f. 10–19.

Hab. The coralline region.

Desc. Body slender, with twenty to twenty-two tentacula about an inch long. Branchiæ arbuscular, in one pair; "behind them stand a pair of short, obtuse, pellucid stumps, which are not distinguished by obvious peculiarities." Tentacula spotted with brown, and "a row of short obtuse teeth, somewhat apart, border each side of each tentaculum, such as have not been remarked in any of the others."

"This is the most beautiful of the genus, mottled, patched, or speckled with variegated colours, wherein brown, green and yellow predominate. A longitudinal light line traverses the speckled olive back; the root of the pencils is bounded by a dark line, and a stripe within two darker lines runs down the belly. Faint green stains the tentacula, their row of oblong or oval spots down the middle contracting or dilating along with their action.

"The spotted *Terebella* constructs a very compact, small, cylindrical tube of minute grains of sand, which is prolonged by irregular curvatures. In the natural state it is attached to corallines or similar marine products, with their slender filaments alternately interwoven

in its sides. The tube follows no regular course, wherever constructed."—*Dalyell.*

39. VENUSIA.

Char. Body vermiform, with setigerous and uncinated feet to all the segments: head disciform, with an everted cartilaginous border produced on each side of the mouth into a tentacular lobe: mouth inferior, over-vaulted with a cartilaginous concave hood: sternal band continuous down the abdominal surface, and coequal in segmentation: branchiæ tufted, one pair: bristles and uncini as in *Terebella.*—Tube adherent throughout, horizontal.

1. V. punctata.

Sabella conchilega, *Mont. Test. Brit.* 547.
Terebella conchilega, *Dalyell, Pow. Creat.* ii. 199. pl. 28. f. 3–8.

Hab. The coralline region, very common.

Obs. The tube is adherent throughout, generally constructed on old bivalve shells; and the inside of a valve of *Venus islandica* is an especial favourite locality. It is cylindrical, equally open at both ends, sinuous, from 6 to 10 inches long, thicker than a quill, coated completely with gravel and fragments of shell; and occasionally ornamented with pieces of the common *Sertulariæ.*

The worm is of a translucent pale-reddish colour, and smooth. The tentacula are numerous, long and very extensile, prettily speckled with reddish spots. The branchiæ are in a single pair, and, unlike those of *Terebella,* they consist of a tuft of simple filaments tapered to the tip, which is dark-coloured. The body is of the usual form; the thick anterior portion composed of narrow segments, and graduating into a knotted cylindrical abdominal portion of considerable length. Its segments are at first shorter than their diameter, but they soon become longer, until they at length are twice as long, and thickened at their junctions, making a segment having some resemblance to a dice-box. These segments are all speckled with scarlet dots. But the peculiar marking of the dorsal surface constitutes the distinguishing character of the species. It is punctated, in a very pretty way, with clear roundish spots, imitating lacework in their arrangement. The character is very obvious with a hand-glass in every specimen I have examined. The sternal band is continued, but the first seventeen segments are most marked, and constitute the thoracic portion. The abdominal is terminated by a caudal portion composed of small short segments, and having the appearance of a regenerated part. The feet are similar on all the segments; the thoracic placed on a thickened lateral fascia; the abdominal on the thickened posterior edge of its segments, where they form a very prominent mammillated tubercle on each side. The bristles and uncini present no describable peculiarity.

The *Nais auricularis* of Bosc (*Hist. nat. Vers*, i. 240. pl. 7. f. 9) may be the abdominal portion of a small *Venusia*.

This is not the *Terebella conchilega* of Pallas, nor the *T. cristata* of Müller, nor do I find it described excepting by Dalyell. The worm is of a pale-reddish translucent colour, with numerous long tentacula, which are prettily speckled with red or scarlet dots. The head is defined and encircled by a membranous collar divided into two lobes by a deep sinus on the dorsum, and behind this sinus there are two to four specks, which may be eyes. The branchiæ are in a single pair, tufted; the filaments tapered, and with dark apices. The anterior segments are short; the following are about as long as broad, and they lengthen backwards so as to become three times as long as their diameter, but they do not differ in any peculiarity. Every one has a pair of setigerous as well as of uncinated feet; and the figure formed by the uncini is a short ellipsis. The abdominal portion is often spotted like the tentacula with scattered red dots. On the abdominal segments they are raised on prominent obtuse papillæ, one on each side of the posterior line of the segment. Caudal segments very short. Abdominal band smooth. Dorsum smooth and even. The bristles and uncini offer no peculiarity.

(*a*) Berwick Bay—the tube on *Venus islandica*.
(*b*) The tube on *Pecten maximus*.
(*c*) Berwick Bay: the animal only, *Dr. Johnston*.
(*d*) South Devon, *George Montagu*.
(*e*) Berwick Bay, *Dr. Johnston*.
(*f*) Berwick Bay, *Dr. Johnston*.
(*g*) The case and tenant on *Cardium echinatum*.
(*h*) A case overgrown with *Sertulariæ*, Berwick Bay, *Dr. Johnston*.

40. TEREBELLIDES.

Terebellides, *Sars, Beskriv.* 48 (1835). *Grube, Fam. Annel.* 81. *Edwards in Lam. An. s. Vert.* 2de édit. v. 608.

Char. Body vermiform: branchiæ consisting of four vertical pectinated leaf-like lobes supported on a common stalk, and placed on the back in front: mouth with numerous capillary tentacula.

1. T. Strœmii.

Terebellides Strœmii, *Sars, Beskrivelser*, 48. pl. 13. f. 31.
Terebella pecten, *Dalyell, Pow. Creat.* ii. 208. pl. 26. f. 9.

Hab. Shores of Scotland, *Dalyell*.

Desc. "Length 4 lines, with long black bristles, forming pencils down the sides. A wide thin lip in front. Tentacula about twenty. Branchiæ peculiar. A stout fleshy stem sustains the whole, which consists of four members, two larger, two smaller, each composed of a rib with prolonged cylindrical and somewhat extensile subordinate

organs from one side, on the whole resembling four combs with long flexile teeth. These branchiæ testify considerable action. Colour of the animal reddish. Only one specimen occurred, which had quitted its dwelling; nor did it construct a new one when supplied with sand and earthy matters."—*Dalyell.*

B. *Amphictenea.* Front armed with a transverse row of stiff bristles.

41. PECTINARIA*.

Amphitrite†, *Müll. Zool. Dan.* i. 27 (1788). *Cuvier, Tab. Elem.* 1804.
Terebellum, *Denys de Montfort, Conchiol. Syst.* ii. 11 (1808).
Cistena, *Leach in Suppl. Encyclop. Brit.* i. 452.
Pectinaria, *Lam. Anim. s. Vert.* v. 348. *Blainville in Dict. des Sc. nat.* lvii. 436.
Amphictene, *Savigny, Syst. Annel.* 69 & 88 (1820).

Char. Body conical, short, appendiculated behind, polypodous: head undefined, the front disciform and obliquely truncate, armed with a row of prominent bristles in two fan-shaped sets above the mouth, which is subcentral, bilabiate, and overhung above by a marginal fringe of numerous short tortuous channeled tentacula: tentacular cirri four, a pair on the sides of the first and second segments: branchiæ in two pairs, on the sides of the third and fourth segments, short, flattened, formed of a closely compacted unilateral series of vascular lamellæ. Thoracic portion greatly developed, of seventeen segments, distinguished by a series of setigerous feet along each side; the foot (excepting the first three pairs) bilobed, the superior lobe with a fascicle of setaceous bristles, the inferior linear-elliptical, with a linear series of minute hooklets: abdominal portion separated by a deep stricture, small and indistinctly segmented, apodous.—Tube free, conical, widely open at both ends, composed of agglutinated grains of sand, and even on the surface.

1. **P. belgica**, front obliquely truncate, the space behind the spines smooth; tentacular cirri simple; abdomen oblong, truncate on the lower margin.—Tube straight.

Nereis cylindraria belgica, *Pallas, Misc. Zool.* 122. pl. 9. f. 3–13.
Sabella tubiformis, *Penn. Brit. Zool.* iv. 148. tab. 92. f. 163; and edit. 1812, iv. 372. pl. 95. f. 2.
Nereis conchilega, *Penn. Brit. Zool.* iv. 47 (1777).
Sabella belgica, *Turt. Gmel.* iv. 611. *Dalyell, Pow. Creat.* ii. 178. pl. 25. f. 5–9.

* From *pecten*, a comb, and suggested by the pectinated form in which the bristles on the head are arranged.

† When Müller proposed the genus *Amphitrite* (1771), it was ill-defined and miscellaneous, but in the *Zool. Danica* the name is expressly assigned to the species of the *Pectinaria* of Lamarck.

Sabella granulata, *Mont. Test. Brit.* 544. *Stew. Elem.* ii. 423. *Turt. Brit. Faun.* 202. *Penn. Brit. Zool.* iv. 369. edit. 1812.
Nereis pectinata, *Turt. Brit. Faun.* 134.
Amphitrite auricoma, *Cuv. Règn. Anim.* iii. 195. *Griffith's Cuv.* xiii. 14. *Penn. Brit. Zool.* edit. 1812, iv. 91. *Stew. Elem.* i. 389. pl. 12. f. 1, 2. *Rathke in Ray Soc. Rep.* 1845, 283. *Williams in Ann. & Mag. Nat. Hist.* ser. 2. xii. 396.
Pectinaria belgica, *Lam. Anim. s. Vert.* v. 350; 2de édit. v. 602. *Templeton in Loud. Mag. Nat. Hist.* ix. 234. *Landsborough, Excurs. Arran*, 50. *Grube, Fam. Annel.* 82.
Cistena Pallasii, *Leach in Suppl. Encyclop. Brit.* i. 452. pl. 26.
Amphictene auricoma, *Savigny, Syst. Annel.* 89.

Hab. Sandy shores within the lowest tide-mark.

Desc. Worm cylindrical, rather more convex on the dorsal than on the ventral surface, tapering insensibly backwards, and terminated by the abdomen in the shape of a semiovate appendage or disk separated from the body by a deep stricture; the body invested with a smooth thin serous skin reflecting a blue and green iridescence, and annulose, with the lines of separation most distinct on the ventral side. There is no head properly so called, but the first four segments constitute a cephalic portion. The spines which guard the front are in two fan-shaped fascicles, and form a stockade or comb of strong bristles in a single line, the central bristles of each comb being the longest, whence they lessen towards both sides; there are about sixteen bristles in each fascicle, which are setaceous, smooth, curved, and weak at the points, so as to resemble a waggoner's whip, and of a golden bronzed colour. The tentacles which garnish the ventral margin of the front, and overlook the mouth, are filiform, and capable of being extended and contorted; but the cirri on the sides are setaceous, and longer than those on the second segment. The branchiæ occupy the sides of the third and fourth segments, where they are rendered conspicuous by their bright vermilion colour; they are short, and consist of numerous lamellæ in a unilateral imbricated closely-set series; the anterior pair larger than the posterior, with somewhat triangular lamellæ, while those of the posterior pair are elliptical. There are sixteen pairs of feet, a pair to each ring of the thorax: the anterior pairs are smaller, and more wide apart than the posterior, which become crowded. Each foot has a protuberant ramus armed with a fascicle of dark burnished bristles, which vary in number, there being only a few (about four or five) in the anterior pairs, about nine in the middle pairs, and again about five in the posterior pairs. The bristles are all simple and smooth, those of the front and middle feet setaceous, some straight, and some bent about the middle; those of the posterior feet stouter and shorter, and curved at the point. To every foot there is a ventral or inferior linear-elliptical lobe, constructed with a long series of minute denticles forming a straight line. The caudal portion has no feet nor bristles, but is obscurely annular, the furrows being convex and a little divided; or, as Sir J. G. Dalyell describes it, it is a "large scoop exhibiting rudimental segments indenting the back." Tube cylindrical, tapering insensibly and very slightly back-

wards, thin, brittle, and arenaceous, composed of equal grains of sand neatly cemented together, and smooth on both the exterior and interior surfaces; the apertures circular, with an even thin rim. A specimen that measured 16‴ was 4‴ in diameter at the anterior, and 3‴ at the posterior aperture.

The description given by Pallas of this worm is inimitably excellent. Amongst other things he tells us that the tube stands immersed in the sand in a perpendicular position; and indeed the worm is very helpless when it is laid horizontally. When at ease, and covered with the water, it protrudes from the wide aperture of the tube, the head with its four cirri, the comb of bristles, and its many tentacles. The latter are in continual movement; they are shortened and lengthened, and twisted about at will, in search seemingly for fit grains of sand; and as the grains adhere, by a gluten secreted from the surface, they are carried within reach of the other organs, by means of which the worm applies them to the rim of its tube, and thus carries the structure upwards. The tube is only increased by addition to this end; the posterior is plugged with the abdominal appendage, and undergoes no material alteration*. The size of the tube corresponds exactly to that of the worm; and the animal can withdraw within it for shelter. It can also turn itself in the tube so as to alter the relation of the back and venter to the sides of the case. This, according to Pallas, never exceeds $2\frac{1}{2}$ inches in length; but Sir J. G. Dalyell has seen a specimen from Shetland 5 inches long, with a tenant "$4\frac{1}{2}$ inches in length, by about $\frac{3}{4}$ of an inch at the shoulder." It is not unlikely that this giant was the representative of a different species.

The *Pectinaria auricoma* of Blainville (*Dict. des Sc. nat.* lvii. 436, *Atlas*, f. 1) is also distinct, and may be distinguished by the posterior cirrus being bifid at the point, and longer than the anterior cirrus, and by the feet being equally distanced.

(*a*) South Devon, *G. Montagu*.

2. **P. granulata**, front obliquely truncate, the space behind the spines rugose; marginal tentacula very short; abdomen spathulate, pointed at the end.—Tube slender, tapered posteriorly and curved.

Sabella granulata, *Linn. Syst.* 1268.
Amphitrite auricoma, *Müll. Zool. Dan. Prod.* 216; *Zool. Dan.* i. 26. tab. 26.
Pectinaria auricoma, *Grube, Fam. Annel.* 82.

Hab. The coralline region.

Obs. As might be inferred from an inspection of the tube, this worm is more slender and quickly tapered than the *P. belgica*. Other distinguishing marks are expressed in the specific character.

* "This creature constructs a very delicate tube, as thin as paper, exclusively of the grains of sand agglutinated together in an extraordinary manner. The thickness of the side does not exceed a single grain, each lies in its proper place,

The number of segments, and their structure, appear to be the same; but the abdominal portion has a pointed end, which covers, like a flap, the anal aperture. There is a great similarity in the colour and form of the cephalic spines, and of the bristles of the feet. There are about thirteen spines in each frontal fan. The inferior lobe of the foot becomes more developed on the posterior segments, and assumes the form of a triangular auricle, on the margin of which the uncini or hooklets are inserted like a neat edging. There is a small papilla on the dorsum of the caudal flap.—The tube resembles the *Dentalium entalis* in size and figure. It is usually about 2″ long, as large at the superior aperture as a small goose-quill, tapered backwards to a point, and slightly curved, arenaceous and brittle, the surface even, with the grains of sand so joined together as to give them an areolated appearance.

(*a*) Berwick Bay, *Dr. Johnston.*

I had included *Amphitrite auricoma* of O. Fabricius in my synonymy of this species before I possessed the "Familien der Anneliden" of Dr. A. E. Grube, on whose authority I now keep them separate. The third species is also, probably, native to our seas; and it may be useful to append Grube's specific characters:—

1. **P. belgica**, body gradually narrowed backwards, with all the segments short; frontal edge of the head with 60 or more tentacular papillæ; tentacula about 20 on each side; bristles of the front 15 on each side; oral veil not separated from the opercular segment by a stricture; hinder margin of the dorsal plate of the opercular segment entire.

2. **P. granulata**, body gradually narrowed backwards, with all the segments short; frontal edge of the head with 24–28 papillæ; tentacula 16 on each side; bristles of the front 13–16 on each side, acute; oral veil not separated from the opercular segment by a stricture; hinder margin of the dorsal plate of the opercular segment with about 14 denticulations.

3. **P. grœnlandica**, body gradually narrowed backwards, with all the segments short; frontal edge of the head with about 46 clavate filaments; tentacula about 60 on each side; bristles of the front 9–10 on each side; oral veil not separated from the opercular segment by a stricture; hinder margin of the dorsal plate of the opercular segment entire.

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and the whole is lined with the slightest silken coating. The sand being collected at the orifice of the tube, its tenant, chiefly by means of the tentacular organs, selects those which are appropriate, and applies them to use. This is done only through the night, all the additions being made at the orifice, and as the animal grows, the shape and dimensions of the tube, being an inverted conic frustum, result from the successive growth of the body."—*Dalyell.*

Fam. XVI. SABELLARIADÆ.

Hermellacea, *Grube, Fam. Annel.* 83.
Hermelliens = Hermellea, *Quatrefages in Ann. des Sc. nat.* x. 12, 13 (1848).

Char. Body vermiform, subcylindrical, of two distinct portions; the anterior segmented with setigerous and uncinated feet; the posterior narrow, without segments and apodous, like a caudal appendage: head disciform, armed with concentric circles of dissimilar and peculiar bristles, and cleft longitudinally into two equal halves, capable of being separated when the animal is protruded, and exposing the numerous tentacula which fringe the edges on their ventral surface: mouth at the base of the cylindrical neck formed by the head-lobes, encircled with a somewhat extensile lip, emaxillary: branchiæ in pairs on all the segments, dorsal, lingulate, or very narrowly triangular: feet in two series, the upper prominent, armed on some of the anterior segments with flat, but otherwise with hooked bristles, rudimentary or wanting on the second segment, and on the following segments furnished with small fascicles of capillary bristles.

42. SABELLARIA.

Sabellaria, *Lam. Anim. s. Vert.* v. 350. *Grube, Fam. Annel.* 84.
Hermella, *Savigny, Syst. Annel.* 81. *Quatrefages in Ann. des Sc. nat.* x. 13 (1848).

Char. Cephalic disk opercular, armed with peculiar and dissimilar bristles (paleæ) arranged in three or two circular series; post-occipital segment elongate, smooth, cleft beneath, and fringed with numerous tentacular filaments: thoracic portion with three pairs of lateral feet armed with lanceolate bristles in a flat brush: bristles of the abdominal segments setaceous: hooklets minute, peculiar, in a marginal series, and each attached to a long capillary filament.

The *Sabellariæ* are oviparous, and the ova are laid from spring to autumn. They live between tide-marks, and the alternate submersion and exposure to the atmosphere seems to be, according to M. de Quatrefages, very favourable to their growth and increase. It is not, however, a condition essential to their life. Specimens have been taken from shells, and from oyster-beds, dredged from the depth of several fathoms; and a very favourite locality is the root of the Laminariæ, which, on our northern shores, is rarely uncovered by the water.

1. **S. anglica**, opercular disk with three rows of dissimilar paleæ, the exterior palmate, with five to seven smooth digitations, the central not disproportionably elongate.—Tubes massive, irregular, formed of coarse sand, and cemented together by similar sand in the interspaces.

Tubularia arenosa anglica, *Ellis, Corall.* 90. pl. 36.
Tubipora arenosa, *Linn. Syst.* x. 790.
Sabella alveolata, *Linn. Syst.* xii. 1268. *Williams in Ann. & Mag. Nat. Hist.* ser. 2. xii. 396; *Rep. Brit. Assoc.* 1851, 186.
Amphitrite alveolata, *Cuv. Règn. Anim.* iii. 195; *Illustr. edit. Annel.* 26. pl. 6. f. 2.
Amphitrite ostrearia, *Cuv. Règn. Anim.* iii. 196.
Sabellaria alveolata, *Lam. Anim. s. Vert.* v. 352; 2de édit. v. 605. *Blainville in Dict. des Sc. nat.* lvii. 435, *Atlas*, pl. fig. 1. *Stark, Elem.* ii. 133. *Templeton in Loud. Mag. Nat. Hist.* ix. 234.
Hermella alveolata, *Quatrefages in Ann. des Sc. nat.* x. 14 (1848).
Sabellaria anglica, *Grube, Fam. Annel.* 84.
Sabella alveolaria, *Dalyell, Pow. Creat.* ii. 175. pl. 25. f. 1–3.

Hab. Near low-water-mark, and within it, at the roots of the large Laminariæ, and on shells and stones.

Obs. The tubes of this species form irregular masses, generally impacted amidst the branching roots of the large Laminariæ, or heaped on old shells and stones from the coralline region. The size of a mass cannot be ascertained, for it has no definite limits; and sometimes the tubes are single and separate*. They are formed of coarse sand and comminuted shells cemented together; but in general the mass is not so firm but that it is easily broken up by the fingers. As Ellis says, it is "of a dark sandy colour, brittle texture, rather light than heavy, porous on all sides, but on some distinguished by peculiar apertures." The tubes are irregularly mixed, usually somewhat flexuose, about an inch or an inch and a half in length; not in close apposition, and the spaces between are filled with sand of the same kind as that of which the walls of the tubes are constructed. The aperture is circular and even, sensibly expanded, and often tinged with purple. "These tubes, as hath been observed above, are not of the same dimensions, nor always straight: but in this they all agree, that their bottoms are closed up, the animals filling up behind, as they advance forward, by a constant apposition of sandy particles, united together by a glutinous matter issuing from them."—*Ellis.*

Sir J. G. Dalyell has given the following interesting account of the species:—"This is a timid, lively, active creature, whose most prominent property is constructing itself an artificial dwelling of the grains of comminuted sand, intermingled with shelly fragments, or other indurated substances. But there seems a great difference in the solidity of the dwelling according to the position of the tube, or

* "Il ne faut cependant pas croire que la première forme toujours par la réunion de ses tubes des masses plus ou moins considérables; car nous avons trouvé souvent des individus solitaires dans les divisions radiciformes des fucus de nos côtes."—*Blainville.*

perhaps the variety of the architects, which has never been the subject of sufficient observation. Thus we find the fabric, when a cylindrical segment running over some flattened surface, firm, durable, and capable of great resistance. It is not easily crushed. On the other hand, when cylindrical or alveolar, it appears to be always more brittle. Most of the dwellings of the *Sabella* are lined with a fine silky substance formed of an exudation escaping from the body, which, consisting of indurated glutinous matter, is very conspicuous on breaking up the alveolar mass of some old congeries. The animals testify a decided preference on choosing the materials of their habitations. While always preferring sand and comminuted shell, pounded glass is sparingly and reluctantly employed, and unless for a few fragments, it is soon entirely rejected.

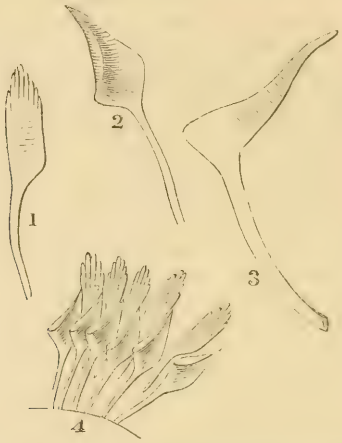
"But there is a striking difference in the character of the tubes. One is short and confined, extending little beyond mere accommodation for the body; another is considerably prolonged, so as to afford a safe retreat in times of danger. The architect of a third seems to persist in advancing the fabric as long as it can procure materials. It never wearies of working*."—"Night is the chief season of architectural labour, though perfect idleness never leaves the day unoccupied. By means of the tentacular organs, and the cleft in the anterior part, grains of sand are selected and adapted to the precise spot, where glutinous matter secures them to the tube for sheltering its otherwise defenceless tenant."

This tenant is wonderfully made. The body is less than an inch in length, of a subquadrangular form, slightly tapered from the thorax to the tail, which is terminated with a narrow caudal appendage, usually curved or bent upon the back: the anterior portion is generally coloured with purple; the abdominal is straw-yellow, becoming pink or fine red posteriorly. The head is in the form of a circular opercular disk divided into two equal halves by a slit, and consists of three concentric rows of bristles which have a pearl-like polish, and are very remarkable in their disposition and structure. In the centre of the disk we find the mouth in the form of an elliptical fissure surrounded with the inner row of bristles inclined towards the orifice. These bristles are triangulate, the portion imbedded in the parenchyma being elongate, narrow, and cylindrical, while the exposed portion is suddenly altered in direction so as to make a knee at the bend, whence it tapers gradually to a point. This portion is brown, and finely striated crosswise (No. XLIII. fig. 1). The middle circle consists of bristles which have a large bulged subtriangulate head, supported on a narrow stalk, entirely immersed in the flesh (fig. 2). The head is brown, hollow, beautifully striated crosswise, and ciliated on the edges of the opening in front. The bristles of the marginal circle look outwards, and form a denticulated fringe. Each bristle resembles a fork, with from five to seven unequal prongs (fig. 3). The shaft is narrow, elongated, with a sharp point, expanding above into a broad flattened hand, divided at the apex into sharp unequal

* On the contrary, De Quatrefages could not get his specimens to work at all. —p. 27.

points, the central ones more prolonged than those on either side. These rows of curious bristles are connected by a sort of membrane,

No. XLIII.—*Sabellaria anglica.*



Bristles of operculum. 1. Exterior. 2. Intermediate. 3. Internal. 4. Diagram showing the relative position of the exterior and intermediate series.

and firmly fixed by their long shafts in the flesh; and they are moveable, at the will of the animal, in different directions, and for different purposes,—but which it is difficult to conjecture*.

(*a*) Berwick Bay, *Dr. Johnston.*

No. XLIV.—*Sabellaria crassissima.*

2. **S. crassissima**, opercular disk with three rows of dissimilar paleæ, the exterior palmate, with five to seven digitations, the central not disproportionably elongate; branchiæ long and narrow. — Tubes aggregate, erect, parallel, composed of coarse sand cemented into a mass.

Sabella alveolata = Honeycomb Sabella, *Penn. Brit. Zool.* iv. 147. pl. 92. f. 162; and edit. 1812, iv. 368. pl. 95. fig. sup. *Mont. Test. Brit.* 540.

Bristle of operculum.

* This description does not agree with that of De Quatrefages. See *loc. cit.* p. 15.

Sabellaria crassissima, *Lam. Anim. s. Vert.* v. 352; 2de édit. v. 605. *Templeton in Loud. Mag. Nat. Hist.* ix. 234. *Grube, Fam. Annel.* 85.
Hermella crassissima, *Quatrefages in Ann. des Sc. nat.* x. 26 (1848).
Alveolaria arenosa, *Leach, Mus.*

Hab. Near low-water-mark on our southern and western coasts.
(*a*) Sandgate, Kent, *Leach.*

3. **S. lumbricalis**, opercular lid with three rows of dissimilar paleæ, the exterior palmate, with the central digitation greatly prolonged and spinous.—Tubes irregularly massive, formed of coarse sand.

Sabellaria spinulosa?, *Grube, Fam. Annel.* 85.
Sabella lumbricalis, *Mont. Test. Brit.* 549. *Turt. Brit. Faun.* 203. *Stew. Elem.* ii. 423. *Penn. Brit. Zool.* edit. 1812, iv. 370.
Alveolaria lumbricalis, *Mus. Leach.*

Hab. The coralline region, and oyster beds.

Obs. The arenose masses formed by the tubes resemble exactly those of *S. anglica*, but the worm of *S. lumbricalis* is readily distinguished by the form of the exterior paleæ of the opercular crown. The body is 1″ long, gradually tapered backwards, with a long caudal appendage, the abdominal portion red or purplish-red. The post-occipital segment is white and smooth, without lobes. The branchiæ are narrow, and as long as the diameter of the body. The abdomen has 24 segments, and becomes swollen, ovate-oblong, and roughish when it is about to terminate in the narrow tail.
(*a*) South Devon, *George Montagu.*
(*b*) Berwick Bay, *Dr. Johnston.*

Fam. XVII. SERPULIDÆ.

Serpulacea, *Grube, Fam. Annel.* 85.

Char. Body vermiform, roundish, with short segments, usually divided into the thoracic and abdominal by the relative position of the bristles and uncini: head amalgamated with the following segment, not noticeable in the full-grown animal: the first segment generally encircled with a collar, and furnished with a tuft of bristles on each side: mouth anterior, placed between the branchiæ, edentulous: feet almost always biserial; in the thoracic division the dorsal are setigerous tubercles, the ventral transverse linear series of uncini; in the abdominal and longer division the lineated uncini are dorsal, and the setigerous tubercles ventral; and sometimes these are wanting, as are seldomer the uncinated series: bristles simple, usually lance-shaped and sharp: uncini siphonate: branchiæ attached to the vertex, flabellate, in two divisions, the rays usually pectinated, and radiating from a common cartilaginous base. Tubicolous.

43. ARIPPASA.

Char. Body composed of equal and similar segments divided by plain sutures, not indented on the sides: mouth surmounted with a cartilaginous bilobed membrane: no antennæ: branchiæ in two fan-shaped tufts, composed of numerous parallel rays, united by a membrane, and free only at the apex, the inner surface densely clothed with capillary filaments: post-occipital segment apodous: segments narrow, not divisible into thoracic and abdominal, dorsal and ventral surfaces alike, and no sternal nor ventral band: feet,—the setigerous tubercles very small, mammillate or level with the surface, with small weak lance-shaped bristles;—the uncinated linear-elongate.

1. A. infundibulum.

Amphitrite infundibulum, *Montagu in Linn. Trans.* ix. 109. tab. 8. *Penn. Brit. Zool.* edit. 1812, iv. 89. *Lam. Anim. s. Vert.* v. ; 2nde édit. v. 611.

Sabella infundibulum, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 449. *Grube, Fam. Annel.* 88.

Amphitrite floscula, *Dalyell, Pow. Creat.* ii. 245. pl. 31. f. 9 (the young?).

Hab. Within low-water-mark.

Desc. "Body long; joints numerous, distant, of an orange colour, annulated with whitish: fasciculi very small: branchiæ obscure: at the base of the tentacula a scalloped membrane: tentacula two, semicircular when spread, and nearly uniting into a regular circle; these are each composed of about 37 rays connected by a transparent web except at the points, which turn a little inwards; the outside of these singularly beautiful arms is smooth and of a purple colour, darkest at the tips of the rays; the inside is most elegantly ciliated with two rows of fimbriæ along each ray, of a chestnut colour, shaded to a purple near the centre: mouth purple, the lips bordered with chestnut.

"This animal is capable of the most sudden contraction, from 8 or 10 inches in length to 3 or 4. It has between 150 and 160 joints, becoming very small at the posterior end.

"The case or tube formed by this species of *Amphitrite* is wholly gelatinous, of a very firm and elastic nature, greenish on the outside, but usually stained black by the soil they inhabit. These cases are composed of many layers or strata, and when the first coat is removed, the remaining part is quite hyaline, and the animal nearly as distinctly seen as through glass.

"This new and interesting species I discovered in the estuary of Kingsbridge, near the Salt-stone, but not common, and only uncovered at the lowest ebb of spring tides. The case is buried beneath the surface, and is only discoverable by a small portion above, appearing like a piece of black jelly. When the tide returns, the animal displays its beautiful tentacula, but rarely exposes its body.

Confined in a glass of sea-water, it sickens in a few days; and if not changed, evacuates its tube and dies.

"In its native abode it recedes on the least alarm; and when the gelatinous case is taken in the hand, and the animal is extended within it, the sudden contraction within the tremulous tube produces a singular and instantaneous vibrative shock to the parts in contact, that, being unexpected, creates surprise.

"The essential character of this species is the connected fibres of the tentacula, in which it differs from all others hitherto described." —*Montagu.*

I have given Montagu's description entire, for the examination of dead and macerated specimens of so remarkable a worm is not satisfactory. It is the type of a distinct genus, or perhaps family. I could not satisfy myself as to the fact, but I believe there is a linear series of uncini on both the dorsal and ventral sides of the small setigerous feet, and that they are all alike constructed. The uncinated lines are not raised above the surface, as are scarcely the setigerous mammillæ; and the tuft of bristles is so inconspicuous that a hand-glass is required to discover their position. The segments are very distinct, but the sutures so much on their level, that the surface is even; and the difference between the dorsal and ventral surfaces can scarcely be detected. The points of the branchial rays are free, naked, and setaceous. The fans have a tendency to assume a spiral, and they are about a sixth of the body's length. The first segment is apodous, pointed in front on the dorso-medial line, four-lobed, and without a frill. In one specimen of moderate size I reckoned about 120 segments, which I mention to show the worthlessness of such a character. There is a deep furrow on the anterior part of the ventral surface, which is not continued down the venter, but turns aside and terminates abruptly.

(*a*) Kingsbridge Estuary, South Devon, *Mus. Leach.*
(*b*) Kingsbridge Estuary, *J. Cranch.*
(*c*) South coast of Devon, Salcombe, *Mus. Leach.*
(*d*) No locality.

The *Sabella villosa* of Cuvier (*Règn. Anim.* iii. , and *Griffith's Transl.* xiii. 12) may be a member of this genus.

44. SABELLA.

Sabella, *Savign. Syst. Annel.* 76. *Cuv. Règn. Anim.* iii. 191. *Schweigg. Handb.* 599. *Grube, Fam. Annel.* 88.
Amphitrite, *Lam. Anim. s. Vert.* v. 354. *Blainville in Dict. des Sc. nat.* lvii. 433.

Char. Body vermiform, distinctly annulated: head defined by a four-lobed everted cartilaginous collar; the front flat and truncate, bearing a pair of large fan-shaped branchiæ, composed of many fringed parallel filaments, united on a cartilaginous base: mouth

vertical, between the branchiæ, and with or without two small setaceous tentacula on each side: two or three post-occipital segments apodous: segments of thoracic portion equal, chetopodous, with a dorsal series of uncini to each foot: abdomen myriapodous, with equal segments, each with a pair of setigerous feet, and a series of ventral uncini, reversing the position they had on the thorax: anal segment small, with a terminal vent without appendages.—Tube cylindrical or tapered at the base, made of fine mud, smooth exteriorly, and coated with a fine membrane interiorly.

* Branchial filaments in a single row.

1. **S. pavonina**, body slender, elongate; two setaceous tentacula; branchial tufts with slender free filaments spotted on the rachis; thorax with nine pairs of setigerous feet. Length 5″; breadth 1‴. —Tube slender, smooth and even. Length 6″; breadth 1‴.

Tubularia penicillus, *Müll. Zool. Dan. Prod.* no. 3063; *Zool. Dan.* iii. 13. tab. 89. f. 1, 2. *Fleming in Edinb. Phil. Journ.* viii. 295. *Fabr. Faun. Grœnl.* 438.
Amphitrite penicillus, *Lam. Anim. s. Vert.* v. 356; 2de édit. v. 610.
Sabella pavonina, *Savign. Syst. Annel.* 79. *Grube, Fam. Annel.* 88.

Hab. The coralline region.

Obs. The tubes are usually clustered, a little creeping at the base, and thence rising up erect: they are cylindrical, composed of fine mud cemented and lined with a glutinous membrane.—They resemble those of *S. penicillus*, but differ in being much smaller.

(*a*) The Nore, *J. Henslow.*

2. **S. penicillus**, body greatly elongated, as thick as a quill; branchial fans large and equal, fasciated with brown and spotted; two setaceous tentacula; thorax with nine pairs of setigerous feet. Length 12–15″.—Tube cylindrical, smooth, formed of fine mud. Length 18–24″; breadth 3‴.

Scolopendra major tubularia, *Bast. Opusc. Subs.* i. ii. 77. tab. 9. f. 1.
Sabella penicillus, *Linn. Syst.* xii. 1269. *Mont. Test. Brit.* 541. *Penn. Brit. Zool.* edit. 1812, iv. 369.
Nereis lutraria? *Pall. Misc. Zool.* 116. tab. 10. f. 1.
Amphitrite ventilabrum, var. 2, *Turt. Gmel.* iv. 82. *Jameson in Wern. Mem.* i. 558. *Turt. Brit. Faun.* 136. *Stew. Elem.* i. 389. *Penn. Brit. Zool.* edit. 1812, iv. 90. *Lam. Anim. s. Vert.* v. 356; 2de édit. v. 610. *Payraudeau, Annel. & Mollusq. de Corse*, 20. *Dalyell in Edinb. New Phil. Journ.* xvii. 415; *Anim. Scot.* ii. 280; *Pow. Creat.* ii. 212. pl. 30.
Amphitrite penicillus, *Mus. Leach.*
Sabella penicillus, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 449.

Hab. The coralline region.

Desc. Body vermiform, subcylindrical, tapering a little to the pos-

terior extremity, from 12 to 15 inches in length, and as thick as a common goose-quill, of a brownish-orange colour more or less stained with the interranea, composed of numerous narrow segments, which are smooth and rather indistinctly defined on the dorsal surface, but very decidedly so on the ventral and crossed with a longitudinal mesial groove. Head undefined, the front truncate, surrounded with a free cartilaginous everted scalloped margin divided into two halves by a mesial fissure; the mouth terminal, nearly central, with a puckered rim, and overlooked by a bilobed organ with a coloured caruncle between it and the dorsal margin. Tentacula two, attached to the cartilaginous base of the branchiæ, setaceous, smooth, about an inch long. There is besides, attached along the base of the branchiæ and trending outwards, a spirally twisted organ with a free setaceous point. Branchiæ attached to the truncate front of the first segment, forming a pair of remarkably elegant large fan-shaped tufts of a straw-yellow colour, beautifully spotted and banded with brown, yellow, orange, green and red, and about 2 inches in height: each tuft consists, in an ordinary specimen, of more than thirty (sometimes as many as eighty or ninety) filaments densely fringed and united together by a common cartilaginous membrane at the base, the rachis striate or annulate when viewed with a common magnifier. The cilia of the fringe are simple, and appear, when magnified, to be divided by pellucid septa like some Confervæ. Thorax of twelve nearly equal segments, distinguished by the stigmata formed by the series of crotchets on each side: the bristles of the foot are numerous, in a round fascicle, unequal, simple, setaceous and sharp, the points of some straight and others obliquely bent. The crotchets are hooked, and so arranged as to resemble the denticles of the tongue of a zoophagous mollusk. The abdomen is myriapodous, with similar segments, upwards of three hundred in an entire specimen, the anal one simple, narrowed and emarginate. Each segment is thickened or warted on the sides, and this part affords a more solid foundation to the setigerous conical uniramous foot, and to the linear series of minute crotchets underneath. The bristles are golden-yellow, and collected into a cylindrical fascicle; and as each bristle is thickened and kneed where the point begins, the apices of the whole are made to converge and form a conical termination. The bristles of the posterior feet become again unequal; the longest are setaceous and straight, but the others are like those of the middle feet.

Inhabits a very long flexible cylindrical tube, formed of fine earth or mud smoothed and cemented by a glutinous secretion. The interior of the tube is lined with a glutinous skin. It is often incrusted with the *Lobularia digitata*.

This magnificent worm was first described by Baster in 1760. By him it was considered to be identical with the *Corallina tubularia melitensis* of Ellis; and this error has continued down to our time, so that the specific name of the worm is difficult to settle. It is not the *Serpula penicillus* of Linnæus in his 10th edition; but the specific character of his *Sabella penicillus*—"S. testa membranacea

erecta radicata,"—contrasted with the character of the *Serpula*—"testa teretiuscula recta basi flexuosa,"—appears to prove that Baster's species was the object he had immediately in view when he published his 12th edition in 1767. The other synonyms, however, may render this inference of mine disputable; and it is safer to adopt the name *ventilabrum*,—the one applied to the species by Gmelin, and generally adopted.

Although common on the British coasts, the worm was not described as a native until by Mr. Montagu in 1804 or 1805*, who, however, did not dispute its identity with the Mediterranean worm, and attributed all the differences between them to geographical position, and to the action of the spirits in which the foreign specimens were preserved. The "extreme elegance" of the worm he dwells on with pleasure; and he correctly tells us that the filaments of the branchiæ are "ciliated on both sides," appearing only semipectinate when in a state of contraction, or when plunged in spirits. His description of the tube is excellent.

The life of this species is an interesting history. Analogy leads us to believe that the eggs, involved in a mass of jelly, are extruded, in their season, from the upper aperture of the tube. Nourished in the jelly, they rapidly pass through the fœtal metamorphoses, and attain the annelidan form so soon as they are free, or, at least, before they are more than 2 lines in length. The first instinct constrains and enables the infant worm to build, out of the mud around it, a tiny case to shield the body; and this is in future always carried onwards as an advanced work, so as rather to receive the body as it grows in size than to wait upon that growth. The growth is rapid; and the external organs, as well as the rings of the serpentine abdomen, are evolved in succession. Thus the worm has at first few segments, and the ornaments of the head may have no more than six filaments. These too are, on their first appearance, simple; and it is a subsequent development that fringes them with cilia, and makes the organ pectinated. When mature, a well-fed specimen may have 92 filaments in each of the fans of the branchial tuft that adorns the head; and the body may consist of not fewer than 350 rings, each with their pair of pencilled feet, and ringlets of many hooklets. Such a specimen will be 15 inches in length; and the tube will be 2 feet.

The tube is essential to the existence of its tenant. The part first formed, to fit it for its purpose, is necessarily of small calibre, and it is laid horizontally. The inmate protrudes its posterior extremity from beyond the lower end of the tube, and fixes it to any adjacent object or support by a glutinous secretion furnished apparently by the anal segment, which, according to Dalyell, is glandular. When the tube has been thus anchored, the entire attention of the worm is directed to its anterior end, which is raised up in a more or less erect posture by continual and incessant additions to the rim of the aper-

* The first part of his work was published in 1803, and I find no date to the second part.

ture*. To catch and collect the muddy material necessary for the work, the branchial fans are spread out into a semicircle, so that when the two are brought into contact a wide funnel is formed. Once in the funnel the muddy water is forced down the rachis of the filaments by the play of the ciliary fringes, and brought within reach of the singular organ at the base of the funnel by which the mud is selected and applied, just as a mason would lay lime on with his scoop, and then mould and smoothen it with his trowel. This beautiful organic apparatus was first noticed by Sir J. G. Dalyell. At the base of the funnel, and towards one side, are two external fleshy lobes or trowels with an organ like a tongue or scoop between them. Receiving the pellets of mud, the creature mixes it up with an adhesive secretion furnished probably by the collar of the cephalic segment and by the organs just mentioned. It is thus rendered consistent and tenacious, and fit to be employed in raising the edge of the tube. To that position the material is raised by the tongue and trowels, aided by a general elevation of the head; and it is fashioned into shape by the same tongue and trowels curved over the exterior circumference as far as they can be stretched, and smoothed and polished by their motions while clasping it with their pressure.

And thus the tube is built up. The lower portion has been left unoccupied, for it has become too straight for the tail, which has grown with the worm's growth; and the upper portion extends far beyond what may at first seem necessary, but its Creator foresaw that it was needful this lower work of His should be able at pleasure to hide the glories with which he has adorned it,—otherwise too seductive to the enemies that were enticed by the richness of the display. For its tube the worm seldom uses other material than soft mud, but in urgent need fine sand may be partially resorted to. The gummy fluid with which it is cemented is, in the first instance, undoubtedly supplied by organs connected with the head; but much is afterwards furnished by the skin of the body to make the interior more consistent and lubricous. Indeed, that the tube may be kept circular throughout, the worm is, while working, in a state of continual rotation,—"a slow revolution, the body passing around within the tube." "Let a tall and ample crystal jar," says Sir J. G. Dalyell, "containing an Amphitrite, be emptied of its contents, and speedily replenished with sea-water,—the animal, if in view, has retreated during the short interval; the orifice of the tube is closed; all is at rest. But soon after replenishment, it rises to display its branchial plume still more vigorously than before, and remains stationary, as if enjoying the freshness of the renovated element, always so grateful,—the harbinger of health and strength to those whose dwelling is there. The passing spectator would conclude that he now beholds only a beautiful flower, completely expanded, inclining towards the light, like some of those ornaments of nature decorating our gardens. He

* "The welfare of the animal is dependent on fixture, otherwise it is totally helpless; neither, until the extremity be secured, does the *Amphitrite* usually venture to show itself. Sometimes the renovated part of the sheath extended an inch or more at the bottom of the vessel, which being attained, all subsequent care seemed to be devoted to the opposite extremity about the orifice."—*Dalyell.*

pauses in admiration. But if a drop of liquid mud falls amidst the element from above, disturbing its purity, then, while the plume unfolds to its utmost capacity, does the animal commence a slow revolution, the body also passing around within the tube*. Now are the thousands of cilia fringing the ribs of the branchiæ discovered to be in vigorous activity, and their office to be wondrous. A loose muddy mass is soon afterwards visibly accumulating in the bottom of the funnel; meantime the neck or first segment of the body, rising unusually high above the orifice of the tube, exhibits two trowels beating down the thin edge as they fold and clasp over the margin, like our fingers pressing a flattened cake against the palm of the hand. During these operations, muddy collections are seen descending between the roots of the fans towards the trowels, while another organ, perhaps the mouth, is also occupied, it may be, in compounding the preparation with adhesive matter. Still does the partial or complete revolution of the plume above, and of the body within the tube, continue; the bulk of the muddy mass diminishes; activity abates; it is succeeded by repose, when the tube is found to have received evident prolongation."

There is no permanent or organic connexion between the worm and its tube, but the worm never leaves it except under circumstances which threaten a slow death. Removed from the tube by accident the tenant cannot reoccupy it, nor reproduce another to cover its nakedness. But it lies exposed ill at ease, and incapable of any motion beyond a painful writhing; casts off its ornaments; becomes weaker, and dies gradually downwards,—that is, the lower portion of the body retains life for some time after the upper has been dead and begun to decompose†.

But so long as it remains within its tube there is no worm more tenacious of life, nor any more richly endowed with the power of repairing wounds and losses. The beautiful tufts on the head are occasionally cast away, as if they were merely parts of its holiday attire; and the worm replaces them, with marvellous promptitude, with a pair not inferior to the first in beauty. A large proportion of the body may be amputated, and it will be restored ultimately to entirety;—and, what is truly wonderful of a creature so complicitly and curiously made, a small portion of the abdominal part has, under the nursing of Sir J. G. Dalyell, grown to be a perfect individual,—having reproduced segments of its own kind, thoracic segments of different character, and the head and all its garniture and bravery!

"At the depth of sixty or seventy feet from the surface of the sea, a black leather-like tube, about 2 feet long, is affixed by the lower extremity to some solid foundation. Its position is erect, gradually enlarging upwards from a very contracted basis, to nearly the size of the little finger, or 5 lines diameter at the orifice. It frequently resembles a reed or vegetable stem of stunted growth, as

* Dr. Williams has explained the mechanism by which this revolution is effected. —Report of Brit. Assoc. 1851, p. 205.

† "The posterior extremity of the *Amphitrite* is much more tenacious of life than the anterior. Its motion continues long after that of the rest has ceased, and the whole animal may be literally said to die downwards."—*Dalyell.*

if furrowed by age, with portions of the bark injured below by decay, but fresher and smoother above, where visibly more recent and entire.

"When originally withdrawn from the sea, the orifice of the higher extremity is closed by compression of the sides; and if the lower part be not ruptured, it tapers down to the point of adhesion. All the intermediate space is quite smooth, when free of corrugations, very elastic to the touch, with the peculiar softness of moistened leather. And, on the whole, when clear and perfect, this submarine product bears the narrowest resemblance to a tube of caoutchouc manufactured by human art.

"We now behold it in its simplest state; but, on plunging this dark, artificial-looking tube amidst a quantity of recent sea-water, the compression above relaxes, and a few air-bubbles escape; the tip of a variegated pencil is gradually protruding, which suddenly unfolds as a splendid plume, composed of many feathers. Thus it remains stationary and motionless, or perhaps it commences a slow, regular horizontal revolution, as if the spokes of an unbound wheel with their vertical axle only. An admirable spectacle is offered to the view. We see a living creature, of infinite beauty, in motion for some purpose, or discharging some function unintelligible. Let the slightest shock be communicated, and the whole instantaneously collapses and disappears within the tube, almost before its image has faded from the eye."—*Dalyell.*

Obs. The filaments in the branchiæ vary from 30 to 80 or 90, and, when combined and expanded, constitute an organ of exquisite beauty, the ground-colour straw-yellow beautifully spotted with brown, yellow, orange, green and red, often forming broad fasciæ in their union. There are 12 thoracic and about 300 abdominal segments in a good specimen. The bristles offer no specific peculiarity.

From the sameness of their characters, it seems almost certain that this and the preceding are the same species in different stages of maturity. It is not the *Sabella ventilabrum* of Gmelin, which is founded on the "Maltese Tubular Coralline" (*Ellis, Corall.* 92. pl. 34), and is a very doubtful member of this genus; nor is it the *Sabella penicillus* of Savigny.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Berwick Bay, *Dr. Johnston.*
(*c*) South coast of Devon, *Mus. Leach.*

3. **S. vesiculosa**, body elongated, as thick as a quill; branchiæ in two equal tufts, with numerous fringed filaments, each with a dark-coloured tubercle, on the inner side, beneath the plain setaceous point; tentacula 2, setaceous; setigerous feet of the thorax in eight pairs. Length 6–7″; breadth 3‴.—Tube coriaceous, coated with sand and fragments of shells. Length 10–12″.

Amphitrite vesiculosa, *Montagu in Linn. Trans.* xi. 19. tab. 5. f. 1. *Lam. Anim. s. Vert.* v. ; 2de édit. v. 610. *Stark, Elem.* ii. 133.

Sabella vesiculosa, *Johnston in Ann. & Mag. N. Hist.* xvi. 449. *Cuv. Règ. Anim. illustr. Annel.* pl. 5. f. 3. *Grube, Fam. Annel.* 88. *Williams in Rep. Brit. Assoc.* 1851, 205; *and in Ann. & Mag. N. Hist.* ser. 2. xii. 395.

Hab. South coast of Devonshire, *Montagu.*

Desc. "Body with numerous annulations of a pale dull orange colour minutely speckled with yellowish-white; a broad indistinct stripe down the back, in the middle of which is a depressed line as far as the ninth joint, where it turns transversely to the left side and is lost; the eight anterior joints are destitute of the dorsal depression, and on this part the branchiæ and fasciculi are most conspicuous: tentacula two, furnished with about twenty-eight long ciliated fibres, each similar in shape to those of *A. geolutea*, but appear subconvoluted, the under part turning inwards; at the point of each ray is a dark purplish vesicle, most conspicuous on the anterior ray of each plume, terminated by a short hyaline appendage: the mouth ringent: lips whitish, furnished with two slender feelers or cirri: behind the plumose tentacula is a scalloped membrane surrounding the anterior end; this, except the lower division, is white."—"This new and beautiful species, like most others of its genus, prepares a tube for its habitation, the internal texture of which is coriaceous like that of *A. ventilabrum*, generally described as *Sabella penicillus*; but the external part is invariably coated with much coarser sand, intermixed with fragments of shells."—*Montagu.*

The branchiæ are about one-sixth the length of the body. The point of the filaments is setaceous and naked; and the dark tubercle is seated, on the inner side, just above the ciliary fringe. It is not a vesicle, but a solid globule filled with coloured granules. It were easy to ask—Are these organs eyes?—for it is now fashionable to ascribe a visual office to every coloured speck to which other function cannot be assigned; but before answering the question, we should remember that to call them eyes were to place an Argus in an eyeless family. The body is thicker than a quill, tapered a little posteriorly: the first segment narrow, the dorsal lobes connivent and pointed in front, with a small perforated wart behind, between it and the second segment; this segment is broader than the others. The following segments are about equal and smooth, the dorsal band divided into small squares by the medial line bisecting the sutures. This medial line does not exist on the thoracic, but begins on the second abdominal segment, and continues to the vent. The bristles in the fascicles of the thoracic feet are of two kinds,—the first dull yellow, stout, with a cylindrical shaft thickened and a little bent near the apex, which is brought to a rather obtuse point;—the second colourless, of unequal lengths, more numerous and slender, with an acute lance-shaped point, acute on both edges. The abdominal feet want the first kind of bristles, but are furnished with a considerable brush of the second kind. The uncini are siphonate, with an entire undivided point.

(*a*) South Devon, *G. Montagu.*

4. **S. bombyx**, body short, of a uniform reddish-brown, with a series of black spots on each side above the bases of the feet; branchiæ in two equal brown-spotted tufts circular in expansion, the filaments furnished on the outer side of their rachis with papillary clubbed appendages in pairs at regular intervals; two setaceous tentacula; thorax with five setigerous pairs of feet. Length 2–3″; breadth 2–3‴.—Tube of fine mud, flaccid, cylindrical, horizontal. Length 2–3″.

A Sabella resembling the Penicillus, *Mont. Test. Brit.* 544.
Amphitrite bombyx, *Dalyell* (1840); *and in Pow. Creat.* ii. 236. pl. 31. f. 1–7; pl. 32. f. 1–13; & pl. 33.
Sabella carnea, *Johnston in Ann. & Mag. Nat. Hist.* xvi. 449 (1846).

Hab. The coralline region.

Obs. The body is depressed, and very little tapered backwards, of a uniform reddish-brown, paler on the ventral surface, with about seventy narrow smooth segments. The branchiæ are exceedingly pretty, and about one-third the length of the body. The collar under the head is pale and everted. The medio-dorsal line begins on the second abdominal segment, and is continued to the vent. The bristles offer no specific peculiarity. Sir J. G. Dalyell says,—"This animal dwells in a tube surpassing its own length, which is not of mechanical construction, but is formed by a spontaneous exudation from its whole body, comprehending the extremities, or from any part of it. When originally produced, it is clear as crystal, completely exposing the tenant's external organization, of corresponding figure. If deprived of the surrounding element, its aspect is somewhat gelatinous, but it seems truly of silken fabric, and becomes quite opake with age. The upper part is corrugated, darker, thicker, and stronger than the rest, evidently for protection of the plume, which is the most delicate part of the creature. The lower extremity is close and obtuse."

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Aberystwith, *J. Henslow.*

5. **S. Savignii**, body short, of a very pale brown, with a series of dark spots above the bases of the abdominal feet; branchiæ in two equal tufts circular in expansion, the filaments unspotted, smooth on the rachis, ciliated throughout; thorax with eight pairs of setigerous feet. Length 2–3″; breadth 3‴.—Tube cylindrical, flaccid, coated with fine mud, even.

Sabella penicillus, *Savign. Syst. Annel.* 78.

Hab. The coralline region.

Obs. Of the size of *S. bombyx*, but the branchiæ are larger, being about one-half the length of the body. They are unspotted and unfasciated in the preserved specimens. The rachis of the filaments is very beautifully annulated with the circular dissepiments.

The dorsal surface of the abdominal portion is marked with scattered black dots; but this character is not constant. The medio-dorsal line begins at the eighth segment. The posterior segments are very narrow and close.

(*a*) *Mus. Leach.* No locality.

6. **S. volutacornis**, body as broad as a man's finger, moderately elongated; branchiæ in two equal tufts rolled up spirally, with 3–5 volutions, the filaments numerous and densely ciliated; thorax with ten pairs of setigerous feet. Length 6″; breadth 6–8‴.

Amphitrite volutacornis, *Montagu in Linn. Trans.* vii. 80. tab. 7. f. 10. *Leach in Supp. Encyclop. Brit.* i. 452. pl. 26. *Lam. Anim. s. Vert.* 2de édit. v. 611. *Turt. Brit. Faun.* 136. *Penn. Brit. Zool.* edit. 1812, iv. 89. *Stark, Elem.* ii. 133.

Amphitrite voluticornis, *Mus. Leach.*

Sabella volutacornis, *Johnston in Ann. & Mag. N. Hist.* xvi. 449. *Grube, Fam. Annel.* 89.

Hab. The coralline region.

Desc. Body 5–6″ long, as broad as a man's finger, depressed, tapered behind, of a wood-brown colour, blotched and stained with a dull blackish-brown extending over the greater part of the abdomen. Branchial tufts one-fifth or one-sixth the length of the body, pale, with a dark-brown fascia at the base, the rachis of the numerous filaments spotted. Collar thick and cartilaginous, four-lobed, the ventral lobes largest, rich-brown, with a pale everted margin. Thorax with ten pairs of stout setigerous feet, and as many linear curved spiracles formed by the siphonate uncini; its segments equal, linear-oblong, depressed on the dorsal, and plano-convex on the ventral side. Abdominal segments about eighty to ninety, with smaller and less protuberant feet, bisected by the dorso-medial line, which begins on the second segment. The branch of the foot has a mammillated top, and a tuft of pencil-like bristles. There is a faint line down the centre of the ventral surface, the skin of which is wrinkled or roughish. Bristles in the thoracic fascicles straw-yellow, numerous, in a cylindrical pointed brush; the bristle is stout, with a cylindrical shaft bent towards the top, where it is thickened, and thence tapered, like a lance, to a fine smooth sharp point; all the points connivent. The bristles of the abdominal feet are similar, but not half so large, with a comparatively longer point.

(*a*) South Devon, *G. Montagu.*

(*b*) Falmouth.

Of the following species I can give no account:—

1. **Sabella unispira.**

Sabella unispira, *Savign. Syst. Annel.* 80. *Cuv. Règ. Anim.* iii. ; *and illustr. edit. Annel.* 23. pl. 4. f. 1. *Williams in Rep. Brit. Assoc.* 1851, 205; *and in Ann. & Mag. Nat. Hist.* ser. 2. xii. 395 = Sabella Spallanzanii, *Grube, Fam. Annel.* 88.

Introduced into our fauna on the authority of Dr. Williams.

2. **Amphitrite rosea, "*Sow.*"**

Amphitrite rosea, "*Sow.*" *Penn. Brit. Zool.* edit. 1812, iv. 90. *Turt. Brit. Faun.* 136.

3. **Amphitrite luna.**

Amphitrite luna, *Dalyell, Pow. Creat.* ii. 249. pl. 31. f. 12, 13.

"The higher extremity consists of forty-four or forty-six tentacula, crowning the body, which projects from an indurated sandy surface covering old shells for about four lines. The tentacula are disposed in lunate or horse-shoe arrangement, resembling the higher portion of *Cristatella*, fourteen or sixteen occupying the interlines. A web, rising about a fifth up the tentacula, unites the roots of the whole. Diameter of the head or tentacular plume a line and a half. Neither cilia nor antennulæ are visible. The animal rises erect from the indurated sand, projecting the head, or hanging over the surface. The termination of the intestinal canal is under the middle of the interior row of tentacula, as in the *Cristatella*."—*Dalyell.*

4. **Sabella curta.**

Sabella curta, *Montagu, Test. Brit.* 554. *Turt. Brit. Faun.* 203. *Penn. Brit. Zool.* edit. 1812, iv. 372.

Hab. The littoral region at low-water mark.

Desc. "S. with a small short tube composed of sand and minute bits of flat stones, agglutinated to a tough membrane; sometimes formed wholly of the finest sand, depending entirely on the soil it inhabits: the case is a little tapering to the lower end, by which it is fixed, and which is generally, for a quarter of an inch, destitute of any covering but a flexible membrane, by which it adheres to the shingle under the surface, between high- and low-water marks, and stands about a quarter of an inch above. Length scarce an inch; size of a crow-quill.

"This *Sabella* is gregarious, covering the whole surface of the shore in the inlet near Kingsbridge; appearing like bits of straw covered with mud, and as close and numerous as stubble in a field. Animal a *Terebella*, small, of a pale yellowish-green colour; proboscis (operculum) pointed, with a few upright filiform green tentacula, and numerous slender ciliated feelers of a pale colour; these are much longer and more slender than the others, and are in constant motion; but both are quickly protruded and contracted. When the animal was immersed in spirits the tentacula instantly contracted, and were totally obscured. Being divested of its case, a radiated tuft was perceived on each side of the head: the annulations of the body about sixteen, with as many fasciculi and short peduncles on each side."—*Montagu.*

45. PROTULA.

Protula, *Risso, L'Europe mérid. Blainv. in Dict. des Sc. nat.* lvii. 432. *M.-Edw. in Ann. des Sc. nat.* (1845) iii. 160. *Grube, Fam. Annel.* 89.
Sabella (—), *Cuv. Règn. Anim.* iii.
Apomatus, β. Psygmobranchus, *Philippi in Ann. & Mag. Nat. Hist.* xiv. 155 & 156.

Char. Body vermiform: head truncate, discoid, with a free collar, crowned with a pair of fan-shaped plumose branchiæ, the filaments united in a cartilaginous base: tentacula two, setaceous, between the branchiæ: thorax with a lateral membrane on each side: abdomen myriapodous, tapered backwards, sometimes subclavate near its termination, the anal segment simple and entire: venter with a narrow band extending the length of the worm: bristles simple, bent near the lance-shaped acute point: uncini siphonate.—Tube calcareous, cylindrical, affixed by the base and otherwise free.

Blainville doubted the existence of this genus, which is defined in a very confused manner by Risso.

1. **P. protensa**, tube cylindrical, even or irregularly wrinkled circularly, chalk-white, attached by the base, flexuous or almost straight, the margin of the aperture even and plain. Length 5–6″; breadth $2\frac{1}{4}'''$.

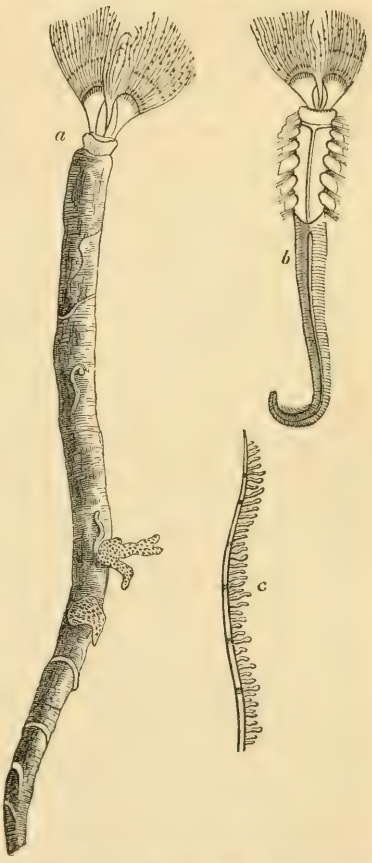
Pinceau de mer, *Rond. Hist. des Poiss.* ii. 76.
Penicillus marinus Rondeletii, *Aldrov. de Test.* lib. iii. 561.
Penicillus = Meerbensel, *Johnst. Hist. nat. de Exang. Aquat.* tab. 17. cum fig.
Serpula tubularia, *Mont. Test. Brit.* 513 (1803), *and Suppl.* 171. *Turt. Brit. Faun.* 202. *Fleming in Edinb. Encyclop.* vii. 67. pl. 204. f. 9. *Penn. Brit. Zool.* edit. 1812, iv. 362. *Dillw. Rec. Sh.* 1083. *Laskey in Wern. Mem.* i. 413. *Fleming in Edinb. Phil. Journ.* xii. 243. *Johnston in Loud. Mag. Nat. Hist.* vii. 126. f. 23. *Berkeley in ibid.* vii. 421. *Brown, Illustr.* pl. 2. f. 9, 10. *Landsborough, Excurs. Arran*, 32.
Serpula intestinum, *Lam. Anim. s. Vert.* 2de édit. v. 619.
Serpula arundo, *Turt. Conch. Dict.* 155. *Berkeley in Zool. Journ.* iii. 229.
Sabella tubularia, *Berkeley in Zool. Journ.* v. 426. *Johnston in Ann. & Mag. Nat. Hist.* xvi. 449.
Psygmobranchus protensus, *Philippi in Ann. & Mag. N. H.* xiv. 161.
Protula protensa, *Grube, Fam. Annel.* 90.

Hab. The coralline region.

Desc. Body vermiform, flattened, narrowed posteriorly, of a reddish-orange colour blotched with irregular stains from the opacity of the viscera and their contents. Head a subcircular disk furnished with two large fan-shaped branchiæ with filaments of a yellowish colour beautifully marked with scarlet spots. The tufts are scarcely one-fourth the length of the body, and the filaments in each are

numerous, united at the base into a short cartilaginous stalk, by which they are attached to the head. Each filament is densely pectinated with a ciliary fringe, and, in specimens preserved in spirits, these cilia always assume a unilateral character. Between the tufts, and at their base, is a pair of setaceous tentacula; and the cephalic segment is encircled with a free cartilaginous wavy margin, which is everted and produced into an obtuse lobe on the dorsal aspect. Thorax of seven equal segments, margined with a narrow brown skin on each side. In the middle of its dorsal side there is a linear-elliptical area bounded by a dark line, and continued down the abdomen for a short way, when it is lost in the mesial line. The abdomen consists of numerous very narrow segments, nearly alike, but insensibly narrowed backwards. Along the ventral surface a ribbon-like elevated tendinous band runs from one extremity to the other, so that the sides on which the setigerous feet are placed are distinctly defined and depressed. There are seven pairs of feet to the thorax, with an equal number of linear series of uncini: the feet of the abdominal portion are very numerous, and the uncini are in a shorter and more elliptical arrangement. The bristles are of different sorts: the fascicle of the thoracic foot consists of a great number divided into three sets; —the upper set are of a clear yellowish colour, setaceous, but bent towards the top and brought to a long sharp point with a narrow cutting edge on the outer side of the bend;— the middle set are stouter and shorter, with a dark lance-shaped point, which is either straight or a little curved;— and the lower set are weakest, transparent straw-yellow, acicular, the long point being brought to a cutting edge on both sides. There are none of the dark-headed bristles in the abdominal feet, but there are the two other sorts not

No. XLV.—*Protula protensa.*



a. The animal in the shell, natural size. *b*. The animal removed from the shell, natural size. *c*. A single filament of a branchial tuft, magnified.

so distinctly separated into sets. Anal segment small and entire, with a terminal orifice; and underneath it a long white spot produced, perhaps, by some dilatation of the intestine.

The shell is from 4 to 5 inches long, and as thick as a goose-quill. It is cylindrical, gradually tapered at the posterior end, where it becomes more or less flexuose, and where it is affixed to the foreign body whence it takes its origin. The colour is opake white, and the smooth surface is usually encrusted more or less with *Lepraliæ*, *Celleporæ*, and small kinds of *Serpula*. The margin of the aperture is circular, smooth and even.

I kept the individual here figured for several days by me, to observe its motions. The worm would sometimes remain for hours concealed in the shell; and, when it ventured to peep out, the branchial tufts were sometimes slowly and cautiously protruded, and sometimes forced out at once to their full extent. After their extrusion, they were separated and expanded, as in the figure, and lay at perfect rest on the bottom of the plate, in unrivalled beauty, and an object of never-failing admiration. The worm, however, seemed never either to slumber or sleep; for, on any slight agitation of the water, occasioned, for example, by walking across the room or leaning on the table, it would at once take alarm, and hurriedly retreat within the shelter of its tube. It was never off its guard, and would often, when lying apparently in calm indulgence, suddenly withdraw, in evident alarm, without a cause but what was gendered by its own natural timidity; for the phantoms of dreams are not, it may be, the visitants only of higher intelligences, but come as they like, in a fearful or cheerful mood, even to these lower things. It never protruded itself farther than is shown in No. XLV. *a*; and, after becoming weak and sickly, it first threw off one half of its pride, a branchial tuft; and after several hours the other was likewise cast away, when the poor mutilated creature buried itself, still living and to live for a day or so longer, in its own house and cemetery.

The anus is at the posterior extremity, as in other worms; but the remains of its food are ejected from the mouth of the shell, in small egg-shaped pellets. By what contrivance this is done, I do not know; are the pellets forced along the dorsal furrow? The fan-shaped fascicles are its breathing organs; and the brushes of bristles in the sides of the mantle are the organs which enable it to move up and down the tube, assisted, undoubtedly, by the rough spots on the margins of the body. This is traversed down the centre of the back with a vessel filled with red blood, and which sends off minute branches to almost every ring.

Mr. Berkeley has attempted to draw a distinction between *Serpula arundo* and *tubularia*. The former, he says, may be known "by its more slender form and delicate substance; neither is the aperture expanded, as in *S. tubularia*. The animal differs from *S. tubularia* in its oblong dorsal area; while that of the latter is much attenuated behind, and in the absence of the operculum." Now, if we turn to Montagu, the original describer of *S. tubularia*, and whose name therefore ought to be retained, we shall find him telling us that the animal has no operculum; and his description of it agrees exactly,

so far as I am able to judge, with Mr. Berkeley's. Indeed, it seems to me, that this very acute and excellent naturalist has confounded the *S. tubularia* of Montagu with the *S. vermicularis* of authors; for, on this supposition, his remarks on their distinctive characters will be found perfectly correct and decisive.

(*a*) Berwick Bay, *Dr. Johnston.*
(*b*) Torbay, *J. R. Griffiths.*
(*c*) Loch Jarriden, *R. M'Andrew.*

2. **P.? Dysteri**, tubes slender, cylindrical, creeping and wavy, uniting into irregular masses.

Protula Dysteri, *Huxley in Edinb. New Phil. Journ.* (1855) i. 118. pl. 1. fig. omn.

Hab. The coralline region.

Desc. "The vermidom (as one might conveniently term the habitations of tubicolar annelids in general) of this annelid is composed of very fine, more or less undulated, white, calcareous tubes, attached by one end to some solid body. Rising from this fixed base, they unite together side by side into irregular bundles, and these bundles anastomose like bundles of nerves in their plexuses—leaving irregular spaces here and there, and thus forming a kind of coarse solid network. Each tube has a circular section, but can hardly be called cylindrical, because it is thickened at intervals, so as to be obscurely annulated.

"When placed in a vessel of clear sea-water, the annelids issue from the tubules of their vermidom, and each spreading out its eight branchial filaments and displaying its bright red cephalic extremity, the mass assumes a very beautiful and striking appearance, singularly resembling a tubuliparous polyzoarium."

"*Protula Dysteri* possesses a very elongated body, which may be conveniently divided into a cephalic, or thoracic, an abdominal, and a caudal portion. The cephalic portion can hardly be said to constitute a distinct head, for the oral aperture, which is wide and funnel-shaped, is terminal. The dorsal margin of the oral aperture is formed by a prominent rounded lobe, beneath which are two richly ciliated, short filaments, which adhere to the base of the branchial plumes, and might be regarded either as their lowest pinnules, or perhaps, more properly, as tentacles analogous to the operculigerous tentacles of the *Serpulæ*. On the ventral side the margin is deeply incised, so that a rounded fissure, bounded by two lips, lies beneath and leads into the oral cavity. From each side of the head springs a distinct branchial plume, whose peduncle immediately divides into four branches. These are beset with a double series of short filiform pinnules, the origins of each series alternating with those of the other. The termination of each branch is somewhat clavate, and when expanded, the eight branches are usually gracefully incurved towards one another, the whole having not a little the aspect of a *Comatula*.

"The thoracic portion of the body is short, but wide and somewhat flattened. It is produced laterally into nine pairs of close-set,

double pedal processes. The lower portion of each process forms a mere transverse ridge, beset with the peculiar hooks to be described by-and-by; the upper process, on the other hand, is conical, and is provided with elongated setæ. The most striking feature of the thorax, however, consists in the peculiar membranous expansion, which, arising as a ridge upon each side of what might be termed the nuchal surface of the animal, and attached to the sides of the thorax, above the bases of the feet, runs down to terminate on the ventral surface, behind the last pair of thoracic appendages. From this origin it extends as a wide free membrane beyond the setæ, forming an elegant collar around the head, on whose ventral surface the expansions of each side unite, and form a wide reflexed lobe, while posteriorly they remain separate. To the thorax succeeds what may be called the abdomen, which is much longer than the other regions of the body; and is, besides, distinguished from them by the imperfect development of the feet, and the paucity of the setæ and hooks. In this, and in the caudal portion of the body, the relative position of the hooks and setæ is the reverse of what it is in the thorax, the former being superior, and the latter inferior. The caudal portion of the body is short, and wider than the abdomen. Its rings are close-set, with well-developed hooks and setæ; and it is terminated by two conical papillæ, between which the anus is situated. There are not less than fifty rings in the whole body."—*Huxley.*

46. SERPULA.

Serpula, *Linn. Syst.* xii. 1264. *Savign. Syst. Annel.* 68 & 71. *Grube, Fam. Annel.* 90.
Les Serpules, *Cuv. Règ. Anim.* iii. 190.
Les Serpulées, *Lam. Anim. s. Vert.* v. 357.
Serpulæa, *Latreille, Fam. Nat.* 242.

Char. Body elongated, narrowed backwards, of numerous segments less distinct above than underneath, and crowded more and more as they near the vent, which is small and not protuberant: first segment truncated obliquely for the insertion of the branchiæ, thin and dilated on its front margin; the six following segments thoracic, with a free undulated membrane along each side, folding towards the back, and armed with six pairs of equidistant setigerous feet, and a lesser pair in front, a little wider apart and more dorsad in position. Head crowned with the plumose branchiæ in two corresponding erect fan-shaped tufts, with filaments ciliated on one side, and divided by faint dissepiments like a Conferva: tentacula two, placed at the base and between the branchiæ, one of them dilated into an operculum: mouth anterior, between the branchiæ, transverse, with plaited equal lips and no tentacula: thoracic feet with a dorsal branch furnished with acicular bristles, and a ventral series of uncini; but the first pair has not the uncini: abdominal feet similar to the thoracic,

but the relative position of the bristles is reversed, the uncinated series becomes dorsal, and the setigerous ventral.—Tube calcareous, vermicular, not regularly spiral.

1. **S. vermicularis**, branchiæ with many filaments in each tuft; operculum on a cylindrical stalk, funnel-shaped, with a concave furrowed disk, the margin multiserrulated, with an equal number of short grooves on the outside.—Tube tapered regularly backwards, round, with a sharp dorsal keel, wrinkled irregularly, the aperture circular, with an even or somewhat everted rim.

Var. α. The tube solitary, entirely adherent, creeping.
Var. β. Tubes clustered, erect, partially adherent.

Tubus vermicularis, *Ellis, Corall.* pl. 38. f. 2.
Serpula vermicularis, *Linn. Syst.* 1267. *Penn. Brit. Zool.* iv. 146; and edit. 1812, iv. 361. *Turt. Gmel.* iv. 605. *Berkeley in Loud. Mag. Nat. Hist.* vii. 421. *Templeton in ibid.* ix. 233. *Brown's Illustr.* pl. 2. f. 2, 3. *Landsborough, Excurs. Arran*, 31. *Philippi in Ann. & Mag. Nat. Hist.* xiv. 157. pl. 3. f. A. *Grube, Fam. Annel.* 99. *Leach, Mus.*
Serpula triquetra, *Bast. Opusc. Subs.* i. ii. 79. tab. 9. f. 3. *Mont. Test. Brit.* 511. *Stew. Elem.* ii. 422. *Fleming in Edinb. Encyclop.* vii. 67. *Laskey in Wern. Mem.* i. 413. *Brown in ibid.* ii. 534. *Turt. Brit. Faun.* 202. *Penn. Brit. Zool.* edit. 1812, iv. 361.
Vermilia vermicularis, *Fleming in Edinb. Phil. Journ.* xii. 242.
Vermilia triquetra, *Brown's Illustr.* pl. 2. f. 1. *Mus. Leach.*
Amphitrite campanulata, *Turt. Brit. Faun.* 137. *Penn. Brit. Zool.* edit. 1812, iv. 91.
Serpula tubularia, *Mont. Test. Brit. Suppl.* 171. *Turt. Conch. Dict.* 154. pl. 24. f. 84.
Serpula contortuplicata, *Cuv. Règn. Anim.* iii. 190; *Griffith's Transl.* xiii. 10. pl. 8. f. 1; *and Illustr. edit. Annel.* 21. pl. 3. f. 1. *Savign. Syst. Annel.* 73. *Grube, Fam. Annel.* 99.

Hab. The coralline region, attached to old shells.

Obs. The shell is about 3″ long, with the aperture 3‴ in diameter. It is generally of a pink colour, rarely white, encircled at irregular distances, but chiefly forwards, with a few thin varices, marking where the worm had rested in its task, and whence it had again resumed the work of prolongation. The posterior end is usually spirally contorted. The dorsal keel is always feeble, more or less broken, and often obsolete on the fore part of old tubes. In a few instances I have scarcely been able to discover a trace of it. The worm is about $1\frac{1}{2}$″ long, and, in large specimens, there may be nearly one hundred segments. The branchial tufts are subequal, folded circularly inwards, with about thirty filaments in each, densely ciliated on the inner side, but leaving the small setaceous point naked. The tufts are fasciated and spotted with scarlet; and the operculum is richly blotched with the same colour. The thoracic portion is about one-fourth the length of the abdominal,—a proportion common to

all the species. Nor have I discovered any character in the bristles that could help us to specific discrimination.

α. (*a*) South Devon, *G. Montagu.*
(*b*) South Devon, *G. Montagu.*
(*c*) Torbay, *J. R. Griffiths.*
(*d*) Aberystwith, *J. Henslow.*
(*e*) Berwick Bay, *Dr. Johnston.*
β. (*a*) Exmouth, *Wm. Clark.*

2. **S. intricata**, branchiæ with many filaments in each tuft; operculum doubly infundibuliform, multiserrulated on the margin, the upper funnel crenate, with a shallow disc. — Tube cylindrical, wrinkled, partially free, irregularly clustered, the aperture circular and plain.

Serpula intricata, *Linn. Syst.* 1265. *Turt. Gmel.* iv. 603. *Stew. Elem.* ii. 422. *Dillw. Cat. Rec. Sh.* 1073.
Serpula vermicularis, *Müll. Zool. Dan.* iii. 9. tab. 86. f. 9. *Mont. Test. Brit.* 509. *Laskey in Wern. Mem.* i. 413. *Brown in ibid.* ii. 534. *Stew. Elem.* ii. 422. *Turt. Brit. Faun.* 201. *Fleming in Edinb. Encyclop.* vii. 67. *Turt. Conch. Dict.* 152.
Vermilia intricata, *Fleming in Edinb. Phil. Journ.* xii. 242.
Serpula Mülleri, *Berkeley in Loud. Mag. Nat. Hist.* vii. 421.

Hab. The coralline region, attached to old shells, particularly to *Venus islandica.*

Obs. Tube 2–3″ long, entirely adherent or partially free, tortuous and bent upon itself, or irregularly spiral, or sometimes nearly straight, but never, so far as I have observed, collected into entangled masses; dirty white, cylindrical, transversely wrinkled, with a round even aperture. It "is never observed to spread at the base, or to possess the smallest degree of carina along the back."—The animal is shorter than the tube, of a straw-yellow colour on the superior half, but orange-coloured below. The branchiæ are spotted or annulated with orange, and the filaments are ciliated until near the apices, which are naked. The operculum is supported on a cartilaginous stalk which expands into a regular funnel; and from the centre of this another funnel, of less size and with a shallower disc, is projected. The margin of both of them is neatly denticulated. Sordes usually adhere to the disc of the outer one, and obscure its character.

3. **S. reversa**, branchiæ with about sixteen filaments in each tuft; operculum doubly infundibuliform, the lower with a multiserrulated margin, the upper with a marginal series of thorny elongated spines. —Tube cylindrical, more or less spiral.

Serpula reversa, *Mont. Test. Brit.* 508. *Turt. Brit. Faun.* 201. *Penn. Brit. Zool.* edit. 1812, iv. 361.
Spirorbis reversus, *Fleming in Edinb. Encyclop.* vii. 69. *Brown's Illustr.* pl. 1. f. 52.

Heterodisca reversa, *Fleming in Edinb. Phil. Journ.* xii. 248.
Eupomatus pectinatus?, *Philippi in Ann. & Mag. Nat. Hist.* xiv. 160, pl. 3. f. 2.

Hab. The coralline region. Common.

Obs. The shell is adherent, dull white, wrinkled, flexuose, and inclined to become spiral, especially behind; and "it is remarkable, in a species so irregular in growth, that the aperture should almost invariably turn in the reversed direction. Diameter at the large end one-tenth of an inch." *Montagu.*—The branchial tufts are equal, and the filaments have a naked setaceous point. The lower funnel of the operculum is of a vitreous white colour, with the marginal serratures continued as grooves down the outside for a short distance. It would make an elegant pattern for a wine-glass; and the entire organ for a cornucopia. The upper operculum issues from the centre of the inferior, is more membranous and of a yellowish-brown colour, and armed around the rim with a series of about twenty stout, erect, spinous processes. Philippi says, that, in his species, there were only twelve of these thorny processes which had three spines on each side, opposite to each other; but in our specimens there was no certain number, varying from five to seven, and they were either opposite or alternate, or sometimes there would be a pair.

(*a*) Aberystwith, *J. Henslow.*

4. **S. Berkeleii**, branchiæ with about six filaments in each tuft; operculum funnel-shaped, smooth, with an entire margin.—Tube triquetrous, with a sharp dorsal keel.

Hab. The coralline region, attached to old shells. Rare.

Obs. The animal is about $1\frac{1}{2}''$ long. The branchiæ are in two equal tufts, the filaments divided to the bottom, beautifully ciliated as usual, with a naked setaceous point. The abortive tentaculum is setaceous; and the other forms a short stalk to a perfectly smooth funnel-shaped operculum.—The tube is adherent by a flattened base throughout, triquetrous, flexuose, of a solid close texture and white colour, with a single dorsal keel.

(*a*) Berwick Bay, *Dr. Johnston.*

5. **S. conica**, branchiæ with many filaments in each tuft; operculum conical, seated in the axil of two soft processes prolonged on each side from the top of the short stalk.—Tube adherent, cylindrical and wrinkled, with a trace of a dorsal keel, the aperture circular. Length $1-1\frac{1}{2}''$.

Serpula triquetra, var. 3, *Mont. Test. Brit. Supp.* 157.
Vermilia conica, *Fleming in Edinb. Phil. Journ.* xii. 243.
Patella extinctorium, *Turt. Conch. Dict.* 138, operculum.

Vermilia triquetra?, *Philippi in Ann. & Mag. Nat. Hist.* xiv. 156. pl. 3. f. F. *Grube, Fam. Annel.* 92.

Hab. The coralline region.

Obs. The branchial tufts are spotted or barred with orange, white and brown. The stalk of the operculum is short, thick, enlarging upwards, and produced at each angle into a soft tentacular process; and between these the conical testaceous operculum is seated. The tubes afford no specific character.

(*a*) Berwick Bay, *Dr. Johnston.*

6. **S. armata**, branchiæ with about eight filaments in each tuft; operculum knobbed with the top blunt, and armed with two or three short obtuse spines, seated in the axil of two soft processes prolonged from the short stalk.—Tube triquetrous, flexuose, with a dorsal keel produced into a mucro above the aperture.

Serpula triquetra, var. 2, *Mont. Test. Brit. Suppl.* 157.
Vermilia armata, *Fleming in Edinb. Phil. Journ.* xii. 243.
Patella tricornis, *Turt. Conch. Dict.* 139, operculum.

Hab. The coralline region.

Obs. The branchial tufts are equal, and banded with rich blue. The point of the filaments is naked and setaceous. The stalk of the operculum is thickened upwards, and produced into a fleshy tentacular process on each side, the operculum being seated between them. This is rather unequally swollen at the base, and fashioned with a sort of short neck above, concave on the top, and armed with three small obtuse spines placed in a triangle on the edges. The thoracic portion of the body is reddish, and along each side of the abdomen there is a band dotted with scarlet.

(*a*) Berwick Bay, *Dr. Johnston.*

This and the preceding (No. 5) are probably varieties of one species,—the *Serpula triquetra* of British authors. See *Sowerby, Gen. of Rec. and Fossil Shells*, tab. fig. 2. *Turt. Conch. Dict.* 152. *Berkeley in Loud. Mag. Nat. Hist.* vii. 421. = Vermilia triquetra, *Templeton in Loud. Mag. Nat. Hist.* ix. 233. *Brown's Illustr.* pl. 2. f. 5. = Serpula triquetra, *Penn. Brit. Zool.* iv. 146; and S. imbricata, *ibid.* pl. 92. f. 157. See also *J. B. Harvey in Charlesw. Mag.* i. 477.

7. **S. Dysteri**, branchiæ with many filaments in each fan-shaped tuft; operculum on a short incrassated stalk, obovate, oblique, with a roughish side-pad, and a tentacular process on the inner side.—Tube cylindrical, with a dorsal keel produced into a mucro on the margin of the aperture.

Hab. The coralline region.

Obs. As beautiful as the finest in its genus. The worm is an

inch or rather more in length, of which the branchiæ may make a sixth part. These organs are equal in size, fan-shaped, the filaments originating from a cartilaginous base, barred with blue, with white, with deeper blue, and spotted with golden-yellow in regular series. The thorax is reddish on the sides; the tapered abdominal portion pale.—The base of the tube is not flat and expanded, but in other respects it resembles *S. triquetra*, from all varieties of which it is distinguished by the operculum. This it is not easy to describe. A short stalk enlarges upwards, and is continued into an oblique knob-like head with a cinereous pad on one side, roughish, and furnished with three minute spines. On the other side, at the separation between the stalk and head, there originates a fleshy process which almost reaches to the summit of the head, and is continued into the stalk below, so as to form a part of it.

(*a*) Berwick Bay, *Dr. Johnston.*

47. DITRUPA*.

Ditrupa, *Berkeley, Zool. Journ.* v. 426.
? Placostegus, sp., *Philippi, Wiegm. Arch.* i. 192 (1844). *Grube, Fam. Annel.* 91?

Char. Branchiæ twenty-two, in two sets, not rolled up spirally, flat, broadest at the base, feathered with a single row of cilia: mantle rounded behind, slightly crisped, denticulated in front, strongly puckered on either side: fascicles of bristles six on each side. Operculum fixed to a conical, pedicellated, cartilaginous body, thin, testaceous, concentrically striated. Shell free, tubular, open at each end.

1. D. subulata.

Dentalium subulatum, *Deshayes, Monog.* 53.
Ditrupa subulata, *Berkeley, Zool. Journ.* v. 427. t. 19.

Hab. Deep water. North-west coast of Ireland, *Capt. Vidal, R.A.*

48. FILOGRANA.

Filograna, *Berkeley, Zool. Journ.* 1827, 229; 1835, 426. *Grube, Fam. Annel.* 94, 139.

Char. Branchiæ eight, filiform, of which two bear an infundibuliform, obliquely truncated operculum: mantle rectangular: fascicles of bristles seven on each side. Shell very slender, filiform, gregarious.

1. F. implexa.

Filograna implexa, *Berkeley, Zool. Journ.* 1827, 229; 1835, 427. t. f. *Sars, Faun det Lief.* i. 86. t. 10. f. 12–19. *Grube, Fam. Annel.* 94.

* From δις, *bis*, and τρύπα, *foramen*.

Filograna, *Planc. Conch.* p. 46 & 113, *App.* t. 19. f. A. B. *Seba, Thes.* iii. 10. f. 8 & 19 *a*.
Serpula filograna, *Linn. Syst. Nat.* p. 1265. *Gmel.* p. 3741. *Berkeley, Zool. Journ.* iii. 230 (1827); v. 426 (1835).
Serpula complexa, *Turt. Conch. Dict.* p. 153.
Filipora filograna, *Dalyell, Pow. Creat.* ii. 250. pl. 34. f. 1–6.

Hab. The coralline region.

Desc. Shell shining, thread-shaped, bunched, with branched, pointed tufts. Animal: with the body strongly compressed, with about 300 rather broadish segments, the last ciliated; on each side two very small, black, remarkable warts, with a pale fleshy and rather obscure longitudinal band; the anterior area of the back oblong, purplish, with a reddish longitudinal band; tufts seven on each side, the anterior of which are more close: terminal membrane of the branches with eight feathery fleshy cilia, two of which possess a somewhat funnel-shaped operculum obliquely truncated.

(*a*) Devonshire.

49. OTHONIA.

Fabricia, *Blainv. Dict. Sci. nat.* lvii. 439. *Leuck., Wiegm. Arch.* i. 193 (1849). *Grube, Fam. Annel.* 95, 139.
Othonia, *Johnston, Loud. Mag. Nat. Hist.* viii. 181 (1834).
Amphicora, *Ehrenb. Mittheil. Naturf. Freunde*, 1836, 2.

There are several remarkable peculiarities in this animal:—the fewness of its segments,—the same number as in caterpillars; the presence of eyes, or at least eye-like specks, on the first segment, and on the caudal one (for this is not an accidental, but a constant character); the form of the head, with the peculiar formation of the branchiæ,—are all characters which separate it from *Sabella*, and mark it as the type of a distinct genus.

This accordingly Blainville has established under the name of *Fabricia*, which is unfortunately pre-occupied in Botany, and is commemorative of the celebrated entomologist. I have consequently thought myself justified in adopting another; and in selecting the christian name (Otho) of the natural historian of Greenland, I adopt one euphonical enough, and I hope unobjectionable, for it has the same intention as De Blainville's had, of honouring the memory of one of the best and most accurate of our faunists.

1. O. Fabricii.

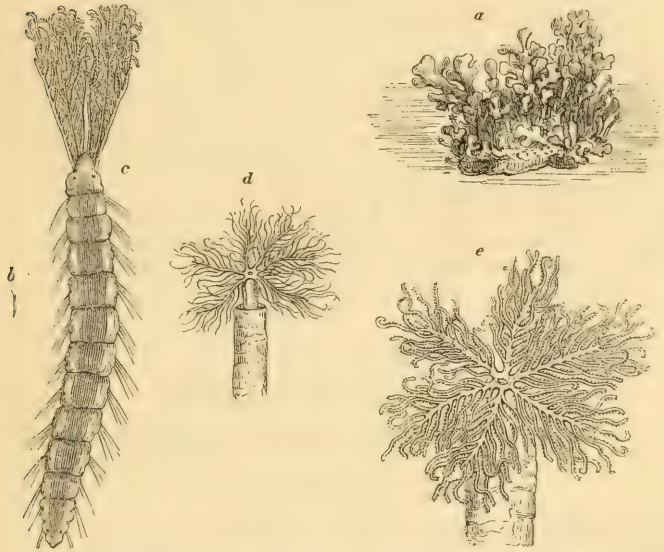
Tubularia stellaris, *Müll. Verm. Hist.* i. pt. 2. 18.
Tubularia Fabricia, *Müll. Prod.* no. 3066. *Fabr. Faun. Grœnl.* 440. f. 12 *a*, *b*.
Fabricia stellaris, *Blainv. Dict. Sci. nat.* lvii. 439.
Othonia Fabricii, *Johnston, Loud. Mag. Nat. Hist.* viii. 181. f. 19.
? Fabricia affinis, *Leuck., Wiegm. Arch.* i. 193 (1849).

Hab. The littoral region at low water mark.

Desc. Body 3 or 4 lines in length, vermiform, cylindrical, nar-

rowed posteriorly, of a reddish or yellowish-brown colour, stained with the contents of the intestine, annulate; the rings thirteen in number, smooth, furnished on each side with a small fascicle of

No. XLVI.—*Othonia Fabricii.*



a. A tuft of *Laurentia pinnatifida*, with the animal intermixed, natural size.
b. Worm removed from the tube, natural size.
c. The same magnified.
d. Head protruded from the tube, with tentacles displayed, as seen through the magnifier.
e. The same more highly magnified.

retractile bristles, which can be pointed either forwards or backwards; the terminal segment semioval, obtuse, marked on each side with a distinct black speck; bristles bent, and somewhat thickened about the middle, whence they taper to a very sharp point; first two segments rather narrower than the following; the anterior with a projectile semioval process on the dorsal aspect, and marked with two round black eyes? placed towards the sides; branchial tentacula one-third the length of the body, straw-colour, unspotted, in two dense tufts originating in the sides of the head, each tuft consisting of three main stalks, which are ciliated with numerous filiform straight filaments, serrulate with very short processes on their inner aspects; mouth between the tufts; intestine straight, nearly equal throughout; the anus terminal; space between the intestine and sides mottled, transparent.

Obs. This, although not hitherto enumerated among our natives, is certainly the most common species of its family on our coast. It lives in a narrow cylindrical tube, about twice its own length, placed in

an erect attitude at the roots of the lesser Fuci. The tube is constructed of fine mud cemented by a glutinous secretion, and lined within by a thin glutinous skin; and if the worm is removed, and left in clean sea-water, it will, after a short interval, be found to have enveloped its body with a similar pellicle. The motions of the tenant in the tube are very lively; it withdraws on the slightest agitation of the water; and after its terror has subsided, it again pushes the feathery tentacula from beyond the aperture, and expands them in a wide circle, keeping them very steadily at rest; but when extracted from the tube, it lies very helpless. The tentacula are then stretched forwards, and generally held so approximated that they form a brush, like a hair pencil, on the head, having however the apices of the filaments always recurved or hooked. Sometimes the two tufts are a little separated even in this state; but from the number and closeness of the filaments, the division of each tuft into three ciliated branches cannot be detected, unless they are lightly compressed between thin plates of glass.

Fam. XVIII. CAMPONTIADÆ.

Campontiens, *M.-Edwards in Lam. Anim. s. Vert.* 2de édit. v. 514.

50. CAMPONTIA*.

Campontia, *Johnston, Zool. Journ.* iii. 235.

Char. Body cylindrical, naked, annulose: mouth with exsertile corneous mandibles: two prolegs on the anal, and two on the first segment.

1. C. eruciformis.

Campontia eruciformis, *Johnston in Zool. Journ.* iii. 325, and iv. 421; *Loud. Mag. Nat. Hist.* viii. 179. f. 18. *Aud. & M.-Edwards, Litt. de la France*, ii. 290, and *M.-Edw. in Lam. Anim. s. Vert.* 2de édit. v. 575.

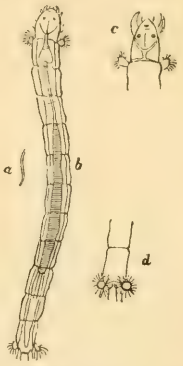
Hab. The sea-shore between tide-marks, where it may be found, at all seasons, at the roots of sea-weeds and corallines, in pools left by the recess of the tide.

Desc. Body 4 lines long, cylindrical, of twelve subequal segments (exclusive of the head) of a clear, faint, water-green colour, smooth, and somewhat corneous. Head distinct, brown, subquadrate, sparingly ciliate on the margins. Eyes two, black, remote, not marginal, placed towards the front. Antennæ two, distant, very short,

* From κάματος, *labor*, and πόντος, *mare*—a sea trouble, probably intended to express the breach it makes in our natural classifications of the Annelides,—just as a "trouble," in the miner's language, breaks through the continuity of his workable seam. Let us, however, remember the axiom of Pallas:—"Nihil Natura imperfectum condidit, quantumvis videri possit anomalum."

inarticulate, setaceous, originating in the front margin. Mouth with a pair of exsertile, corneous, brown, hooked mandibles, which, when in motion, it is seen incessantly to protrude and retract; no proboscis. On the front and ventral margin of the first segment are two short unjointed legs, armed with a circle of retractile claws; and the last segment is furnished, near its termination, with two similar legs: the other segments are footless and naked; but a few hairs terminate the anal segment, which is very slightly lobate. Anus round, simple, small.

No. XLVII.
Campontia eruciformis.



a. Natural size. *b.* Magnified. *c.* The head, slightly compressed between plates of glass. *d.* The under side of the anal segment.

This animal lives among Confervæ, in pools left by the tide; and is very common in Berwick Bay. It moves with considerable quickness by means of its mandibles and legs; for the former seem to be as subservient to progressive motion as the latter; and, during its progress, the upper lip is considerably protruded, as shown in No. XLVII. *c*. Within the first segment we observe a heart-shaped lobated organ, which, although colourless and almost transparent, is undoubtedly the stomach. The very short gullet enters it above; and from its inferior end a small intestine proceeds, which suddenly enlarges at the commencement of the fourth ring, and continues of the same calibre to its termination at the anus. This large intestine is always filled with earthy feculent matter, except that portion of it which traverses the last three segments, and which is usually empty. Two slender thread-like vessels are to be traced winding down the sides in the space between the skin and intestine; these occasionally anastomose by still slenderer transverse branches; but I could not discover any common centre of departure. At the end of the ninth ring there are four filiform, dark-coloured, tubular organs, which seem to originate in the sides of the intestine: they traverse the ninth and a part of the tenth segment, and end apparently with free extremities. These are probably hepatic vessels; and the deficiency of solid feculent matter in the intestine, below their origin, appears to prove their importance and adaptation to the proper assimilation of the food.

When I first described this animal, its close resemblance to some caterpillars was particularly mentioned, and, indeed, suggested the name. That it was actually a larva I was unsuspicious, for I believed it to be an established fact among entomologists that no insect passed its preparatory stages in sea-water. I was however informed, soon after the publication of the genus, that Mr. MacLeay had proved that our worm was the larva, probably, of some dipterous fly; but in what way this conclusion had been arrived at was not stated. Mr. Green thinks that he has confirmed its truth (*Charles-*

worth's Mag. Nat. Hist. i. 279); but, in truth, his remarks are very irrelevant, and deserve no consideration. Milne-Edwards, on the contrary, adopts our original view:—"Ce singulier animal a été découvert sur les côtes de l'Angleterre, par M. Johnston, et ne serait suivant M. Macleay qu'une larve de quelque insecte diptère, mais ayant eu l'occasion de l'observer à l'état vivant, dans la rade de Toulon, nous ne croyons pas devoir adopter cette opinion, et nous sommes portés à considérer ce genre comme établissant le passage entre les Neréidiens et certains Helminthes."

Fam. XIX. ? MÆADÆ.

1. MÆA.

1. **M. mirabilis.** Plate XXII.

Desc. Worm slender and filiform, of the thickness of common twine, and about 4 inches long, soft, distinctly annulated, of a wood-brown colour, with dark specks in clusters along the sides. Head distinct, serpent-like, flattened above, obtusely pointed, scooped underneath; the mouth inferior, about a line from the apex, furnished with a thick, short, subglobular, smooth proboscis. On each side of the mouth at its base, and external to it, there originates a long filiform tentacular appendage, which is fully as long as a third of the total length of the body: they are jointed at not very regular intervals, and naked at the root, but, at a little distance upwards, they begin to be fringed, on one side, with short cylindric obtuse fleshy cirri, in two close-set series, which extend to the very apex. The rachis of the filaments is minutely crenulated on the opposite edge, and it is furnished with numerous dark minute granules, collected, principally, at the origins of the cirri. Thorax of nine segments, of which eight are equal and similar, about twice as long as their diameter, cylindrical, and distinguished by having a vesicular lobe at the base of the bristles, which are collected into fan-shaped fascicles projecting forwards. The bristles in each fascicle are numerous, unequal, simple, setaceous, flexuous, with a long sharp point, smooth. The ninth segment is thoracic, but it is smaller than its antecedents, with larger lobes at the base of the bristles. Abdomen elongated, cylindrical, the segments twice as long as their diameter, each furnished on the sides with a roundish cluster of dark hard granules, and with four fascicles of retractile bristles placed equidistantly. The bristles are simple, smooth, of a straw-yellow colour, rather stout and furcate, being also bent considerably towards the apex. There are about eight in each fascicle, and they are shorter and stouter than those of the thoracic feet; nor have they the lobe at the base, or only in a minor form.

This singular worm was given to me by Dr. Greville, who does not remember the locality in which it was found. He got it, he

believes, while digging with the trowel for littoral mollusca; and we may conclude, from its structure, that it is arenicolous, probably the tenant of a thin and fragile tube. How it disposes its oral filaments, when in its natural condition, it is hard to say. That they are branchial scarcely admits of a doubt, notwithstanding their anomalous position. When highly magnified, the rachis is seen to be permeated by a comparatively large canal running from the base to the summit,—undoubtedly an aquiferous canal; and every cirrus of the myriad that fringe and adorn the upper aspect is a cylindrical obtuse organ, containing a sort of dark grumous or granular texture within a thick transparent coat or skin,—a texture produced by decay and steeping in spirits, but very like the branchial texture in other genera of the class.

It is difficult to assign a place to this worm in our present classifications. The head leads us to compare it with some *Nemertinæ*, for example with *Ophiocephalus*; and yet there is no relationship there. With the *Terricoles* there is much accordance in the general habit, and in the structure of the abdominal portion, more especially in the feet of the bristles being in four fascicles; and there are *Naides* in which the head is distinctly marked as in this new genus, and in which there are two kinds of bristles. Yet it is doubtful whether the resemblance is not merely analogical. To refer the worm to the *Ariciadæ* is a kind of compulsory connexion, for that family is becoming a refuge of unclaimed foundlings. All the *Ariciadæ* known have the branchiæ placed dorsad on the feet, and intimately combined with them; but in this worm they are cephalous, and are far removed from the feet, which are only developed in a small degree. Then for the *Tubicolæ* there are even less claims. The distinct head without appendages, the want of hooklets on the segments*, the quadriserial fascicles of bristles, and the position of the mouth, are all proofs against any true relationship. It may, however, be noticed here, that were the branchiæ of *Pectinaria* to be drawn out into a line, we should have an organ something like to the branchial filament of ——? In these doubts, there really seems no alternative but to make this genus the representative of a distinct family.

* These may be represented by the hard granules, but the latter have no regular position nor form.

Species inquirendæ.

NEREIS.

1. **N. iricolor.**

Nereis iricolor, *Montagu, Linn. Trans.* vii. 82. *Penn. Brit. Zool.* iv. 94. *Turt. Brit. Faun.* 135.

2. **N. margarita.**

Nereis margarita, *Montagu, Linn. Trans.* vii. 82. *Penn. Brit. Zool.* iv. 94. *Turt. Brit. Faun.* 135.

3. **N. lineata.**

Nereis lineata, *Montagu, Linn. Trans.* vii. 83. *Penn. Brit. Zool.* iv. 95. *Turt. Brit. Faun.* 135.

4. **N. maculosa.**

Nereis maculosa, *Montagu in Linn. Trans.* xi. 21. pl. 3. f. 4.

5. **N. rufa.**

Nereis rufa, *Penn. Brit. Zool.* iv. 47. pl. 25. f. 3, and iv. 96. pl. 27. f. 2, 3. *Hogg's Stockton*, 29.

6. **N. mollis.**

Nereis mollis, *Linn. Syst.* 1085. *Turt. Gmel.* iv. 86. *Jameson in Wern. Mem.* i. 557. *Penn. Brit. Zool.* iv. 96. *Bosc, Vers*, i. 168.

7. **N. octentaculata.**

Nereis octentaculata, *Montagu in Linn. Trans.* vii. 84. *Penn. Brit. Zool.* iv. 95. *Turt. Brit. Faun.* 135.

8. **N. punctata.**

Nereis punctata, *Encyclop. Méth. Vers*, tab. 56. f. 19, 20!

Desc. Body $\frac{6}{10}$ths long, $\frac{1}{8}$th broad, linear, nearly equal at both extremities. Back rounded, brown, marked with three rows of light-coloured circular spots arranged longitudinally, and with eight similarly coloured transverse lines placed at unequal distances. The middle series of these spots is the faintest; and besides the three dorsal there is another series on each side placed on the foot-like processes. Head small, quadrangular, corneous, pale, with four black eyes, two on each side, and approximate. Anterior margin of the head furnished with five conical, setaceous, two-jointed tenta-

cula, two on each side, and one in the centre, which is the shortest and inferior. Mouth terminal, with a large projectile proboscis unarmed with any teeth. Feet forty on each side. Each foot is divided at the apex into two processes; the superior terminated with a very long setaceous filament, and furnished with a retractile brush of fine hairs; the inferior has three short setaceous filaments, and a large brush of equally fine hairs. The filaments are not retractile. Ventral surface brownish. Tail abrupt, terminated with two setæ like the lateral filaments. Anus terminal.

This is a beautiful worm, and often glows with a metallic lustre of a light blue reflected from its pale spots. Its motions are very rapid. I have seen only one specimen, and this was many years ago. I had no doubt of its being the *Nereis punctata* figured in the work referred to, but it is not the *Nereis punctata* of Müller. The species is not noticed by Audouin and Milne-Edwards; nor am I able to refer it to any defined genus.

9. **N. noctiluca.**

Nereis noctiluca, *Linn. Syst.* 1085. *Turt. Gmel.* iv. 86. *Penn. Brit. Zool.* iv. 46, and edit. 1812, iv. 93. *Turt. Brit. Faun.* 134. *Stew. Elem.* i. 390. *Abildgaard in Zool. Dan.* iv. 31. tab. 148. f. A. 1–3. *Aud. & M.-Edw. Litt. de la France,* ii. 209. *Dalyell, Pow. Creat.* ii. 161.

There is mention made of the luminous worm in the oyster in *Act. Acad. Nat. Cur.* 1670, p. 309.

10. **N. pinnigera.**

Nereis pinnigera, *Montagu in Linn. Trans.* ix. 111. tab. 6. f. 3. *Penn. Brit. Zool.* iv. 95. *Aud. & M.-Edw. Litt. de la France,* ii. 219.

APHRODITA.

1. **A. annulata.**

Aphrodita annulata, *Penn. Brit. Zool.* iv. 45. pl. 24. f. 28.

2. **A. minuta.**

Aphrodita minuta, *Penn. Brit. Zool.* iv. 45. pl. 24. f. 29.

SPIO.

1. **S. seticornis.**

Nereis minima tentaculis longissimis, *Bast. Opusc. Subs.* ii. 134. tab. 12. f. 2.

Spio seticornis, *Turt. Gmel.* iv. 81. *Turt. Brit. Faun.* 137. *Penn. Brit. Zool.* iv. 92. *Stark, Elem.* ii. 138. *Dalyell, Pow. Creat.* ii. 159. pl. 20. f. 22.

Perhaps a species of *Leucodore*! But see *Oersted, Consp.* 40.

2. **S. crenaticornis.**

Spio crenaticornis, *Montagu in Linn. Trans.* xi. 199. tab. 14. f. 6, cop. in *Encyclop. Brit.* edit. 7. xi. pl. 276. f. 1.
Spio quadricornis, *Lam. Anim. s. Vert.* 2nde édit. v. 559. *Stark, Elem.* ii. 138.

3. **S. calcarea.**

Spio calcarea, *Templeton in Loud. Mag. Nat. Hist.* ix. 234. f. 27.

Obs. Probably the same as *Spio seticornis.*

BRANCHIARIUS.

Branchiarius, *Montagu in Linn. Trans.* xi. 202.

1. **B. quadrangularis.**

Branchiarius quadrangularis, *Montagu in Linn. Trans.* xi. 202. pl. 14. f. 1.

DIPLOTIS.

Diplotis, *Montagu in Linn. Trans.* xi. 203.

1. **D. hyalina.**

Diplotis hyalina, *Montagu in Linn. Trans.* xi. 203. pl. 14. f. 5.

DERRIS.

Derris, *Adams in Linn. Trans.* ii. 67.

1. **D. sanguinea.**

Derris sanguinea, *Adams in Linn. Trans.* ii. 67. tab. 13. f. 1, 2. *Turt. Gmel.* iv. 108. *Turt. Brit. Faun.* 132. *Penn. Brit. Zool.* iv. 101.

"A mighty maze, but not without a plan."

"Pereant illi qui ante nos nostra dixerunt." The better rule is the one now adopted, and first followed by Isaac:—"And he called their names after the names by which his father had called them."—*Genesis*, xxvi. 18.

APPENDIX.

Containing fuller descriptions and accounts of the habits of the species described in the earlier pages of the work, which were printed before Dr. Johnston's death.

Order I. TURBELLARIA, *Ehrenberg* (page 2).

Of this Order M. E. Blanchard, a very competent critic, remarks:—"En outre, cette classe est composée d'éléments hétérogènes, comme l'ont reconnu tous les zoologistes. Aussi, M. Siebold, tout en l'adoptant, l'a-t-il réduite aux deux groupes des *Rhabdocèles* et des *Planaires*. Les *Nemertina*, que certains zoologistes considèrent encore comme devant former un groupe dans le voisinage de celui des *Planariées*, me paraissent, au contraire, s'en éloigner considérablement; et M. Siebold a même cru devoir plutôt les rattacher aux *Annélides*, ce qui, du reste, ne saurait être admis; mais cet exemple montre combien jusqu'à présent les caractères de tous ces animaux ont été peu étudiés et mal définis. Les *Gordius* et les *Naïs*, que M. Ehrenberg range aussi dans sa classe des *Turbellaria*, ont été reconnus par tous les zoologistes, je crois, sans exception, comme appartenant les premiers aux *Helminthes*, et les derniers aux *Annélides*."—*Ann. des Sc. nat.* vii. 100 (1847).

Convoluta paradoxa (page 16).

I had named this species *Planaria macrocephala* because of the bluntness of its head, for the enlarged end is the anterior one, a fact which the mere examination of the figure would never resolve, since the part is distinguished by none of its usual appendages or organs; it has neither mouth, eyes, nor tentacula. But all unfurnished as it is, there is no species of its genus that I have met with that excels it in activity. Ever-restless, it glides along the surface of the vessel with great celerity, varies its course with ease, and sometimes leaving the bottom, it swims in the bosom of the water, but with a tardier pace.

With the obtuse anterior end, which is in constant motion and change, it feels the way, and pushing aside the floating particles that annoy it, it guides itself with as much safety, and appears as careful of obstacles, as if indeed eyes and feelers were sentinels in front.

II. TERETULARIA (page 18).

Char. Worms individual, free, very rarely tubicolous, with or without eyes: body soft, cavernous, linear, flat or somewhat cylindrical, much longer than broad, (very often) clothed with vibratile cilia, sometimes extraordinarily contractile and then generally separating into several pieces by a transverse division. Sucker none. Head continuous with the body or indistinctly defined, entire or furnished with lobes, raised plaits or fissures (perhaps connected with respiration). Mouth anterior and subterminal, in the form of a slit, for the most part provided with a protrusile long proboscis. Œsophagus short: cæcal pouches in a series on each side of the body. *Intestine simple* (without an anus). System of circulation closed; two hearts. Nervous system distinct. Sexes separate, but alike in external appearance; and the cavity containing the testicles and ovaries are alike, excepting in the contents being in the one spermatozoa, and in the other ovules. Female aperture (often mistaken for the mouth) situated sometimes below the head, sometimes large and sucker-like, sometimes posterior and nearly terminal, when it has been mistaken for an anus. Multiply by ovules, and perhaps by transverse sections. Progress by gliding, and some exude a copious mucus.—All are marine*.

These worms are of a linear form and very contractile, so that when extended in the act of moving through the water or mud, they exceed their length when at rest by three, four or more measures. They are soft and glutinous, but with more firmness of structure than their appearance indicates; and to the naked eye they are perfectly smooth, exhibiting no trace of articulations or wrinkles, though when contracted and viewed through a magnifier, we find that the margins are minutely crenulate. The anterior extremity is usually marked by several black specks arranged on each side of it, variable

* The following is De Quatrefages' classification of this tribe:—

A. Nervous trunks entirely lateral.
  * Mouth subterminal, inferior ..... VALENCINIA.
  ** Mouth terminal.
    Body very long and flat ..... BORLASIA.
    Body very long, more or less rounded ..... NEMERTES.
    Body short, proteiform ..... POLIA.
    Body short, not variable in form ..... CEREBRATULUS.
B. Nervous trunks sublateral ..... OERSTEDIA.

in number according to the species, and which are considered by Müller and others as organs of vision. We are not able, with our small microscope, to discover any peculiar organization in them, yet there is reason (notwithstanding the objection of Lamarck, founded on the want of optic nerves and a nervous system *) to assent to this opinion, from the exact resemblance of these points to the eyes of the Annelidans†, and from the very obvious manner in which the worms evince their sensibility to the impressions of light. The species have no other visible exterior organs: they move in an even continuous manner by undulations, frequently imperceptible, propagated along the body, which they often throw into knots and strictures, or extenuate to that degree, that the ordinary breadth shall be more than four times its diameter when in this state of extension.

The internal structure is most easily seen when the worm is slightly pressed between plates of glass, and placed under the microscope. It is more beautiful and complex than the plainness and simplicity of the exterior would lead us to believe, nor indeed can I unravel or describe it with the accuracy that is desirable. The mouth is difficult to be detected, and its position and form are generally indistinct; but sometimes it becomes evident enough, and in other cases, its exact place is often shown by a slight sinus or emargination in the anterior extremity in which it is placed: it is a simple circular pore without any hard parts (Pl. II. B. fig. 5 *m*). From it an intestine descends down the centre of the body, in a straight or undulating line, according to accidental circumstances of position, to the opposite extremity, where it opens outwardly by a pore similar to the mouth, and equally simple. The intestine (Pl. II. A. fig. 5 *i*, *i*) is a cylindrical tube of a firmish texture, and of nearly equal calibre throughout, though subject to partial and temporary constrictions and dilatations, and, as just remarked, its course can be made straight or tortuous at the will of the animal, evidently to accommodate it to the length of the body in its extreme variations; for being apparently of a much less contractile tissue than the body itself, the intestine is doubled in sinuous folds when the worm contracts and shortens; but when this draws itself out in a long line, the intestine becomes a straight canal, with something of the character and office of a vertebral column. In tracing the intestine from the mouth downwards, the structure appears to be homogeneous, and alike throughout in the species placed in the second section of the genus, but in the true *Nemertes* we meet with some remarkable peculiarities towards the middle of its course. First, we perceive on each side a small circular spot or cavity, in each of which are three spines (figs. 1, 2, 4) with their sharp points directed outwards; beneath these there is a cup-shaped organ (fig. 3) encircled above with a faintly plaited membrane, and armed in the centre with a strong spine, which can be compared to nothing more aptly than to a cobler's awl in miniature, the part representing the handle being very dark, and the point transparent

* Hist. nat. des Anim. s. Vert. iii. 177.

† See Müller "Sur les Yeux problématiques des Annélides," in the Ann. des Sci. nat. xxii. 19; and Grant's Outlines of Comparative Anatomy, p. 252–3.

and crystalline (figs. 2, 4). This apparatus is placed within the intestine, is visible only when this is compressed, and is, as I believe, stomachical, having some distant analogy with the proper digestive organs of the *Laplysia* and *Bulla** ; and in confirmation of this view, it may be remarked, that the œsophageal part of the intestine appears to be simple, while the inferior portion exhibits a plaited structure internally (figs. 1, 3). In Pl. II. A. fig. 5, this part is represented as being suddenly narrowed, and after descending a little it bends and ascends for some way, when it is again deflected and ends abruptly in the body ; and such undoubtedly were the appearances in the specimen from which the drawing was made, and in others which I have examined ; but such a disposition of parts is rather uncommon, the usual course being for the intestine to descend tortuously to the anus. I believe that in the contrary instances, the natural adhesions of the alimentary tube have been ruptured by the compression to which the body had been subjected, and that by its contractions, the intestine was then forced into this unnatural position ; for that the intestine terminates and opens at the posterior extremity is certain, the contents having repeatedly been seen to be evacuated there through a small pore. While examining specimens, a large portion of the intestine will occasionally be seen rolling itself from the mouth, like a very long proboscis, until perhaps fully one-half of the tube is evolved,—a fact which I also attribute to the compression of the plates of glass ; for I have never observed the worm naturally to evolve a proboscis, though every pains may be taken to force it to do so, by irritation, by keeping it in sea-water until it corrupts, by immersion in fresh water, or in spirits†.

The intestine lies loose in a distinct abdominal cavity (Pl. II. A. fig. 5, and Pl. II. B. fig. 1) or canal excavated through the centre of the body. This canal seems to contain besides a grumous fluid, which may frequently be observed moving rapidly up and down in irregular currents dependent on the contractions of the worm or intestine, and not at all analogous to the currents within the tubes of zoophytes. It is fringed along each side with a close series of vesicles or cells formed, in the true *Nemertes*, apparently by the folds of a membrane, while in the subgenus *Borlasia* they are separate, and as it were excavated in the parenchyma of the body (Pl. II. A.). The resemblance between this structure and what have been called *cæcal appendages* in some allied worms is obvious‡, though not very

* *Nemertes*, mihi, is evidently the same as the *Prostoma* of Dugès. My *stomach* is his *mouth*. See the Edinb. Journ. of Nat. and Geog. Science, iii. 379. The circulating system seems to be nearly the same as in the *Nais proboscidea*, so far as I am able to judge by an examination of the figure of this given by Gruithuisen in the Nov. Act. Acad. Nat. Cur. tom. xi. pl. 35.

† In some cognate species, Otho Fabricius observed the intestine to be extruded when no compression was used, but still under circumstances easily reconcileable with our explanation. "De orificio antico infero tubulum pallidum *in agone mortis* exserit :" i. e. *Planaria rubra*, Faun. Grœnl. p. 324 ; also p. 325.

‡ Compare our figures of this structure with that of the *Diplozoon paradoxum* of Nordmann in Ann. des Sci. nat. xxx. 382. pl. 20. This figure, on a reduced scale, is copied into the Cyclop. of Anat. and Physiology, i. 654. f. 328 ;

exact, for they are not produced from, nor in organic connexion with the alimentary canal, as is manifest from their remaining unaffected during the motions of the latter, which moreover may be removed entirely from the body without bringing with it, or tearing away, the presumed cæca. These are always full of some opake matter in the *Nemertes*, and some observations lead me to believe that it varies, in intensity at least, according to the nature of the animal's food, whence I conclude they belong chiefly to the digestive system ; while the ova appear to be developed in their interstices, and in the space between them and the skin (Pl. II. A. fig. 2). But in *Borlasia* the cæca are more distinctly vesicular and isolated, and although the depth of colour of their contents varies also, yet they are usually clearer and paler than the surrounding parenchyma, or as it were empty ; and I have plainly seen in them, not often, indeed, oviform bodies, which again have not been detected in the interstices (Pl. II. B. fig. 3). We seem, then, to have combined in them a duplicity of function,—they are both nutrient and uterine cells ; but how far this view can be admitted, I must leave to the determination of some better observer*.

Many specimens, and several species, had been examined before a trace of a nervous system could be detected, and I was ready to conclude that these worms were truly acritous, when I was prevented falling into this error by the discovery of it in the *Nemertes octoculata*. In this species the nervous system is distinct, and I have been able since to see it in several others more obscurely. It consists of a single oblong or ovate ganglion laid over and above the œsophagus posterior to the heart ; and from this ganglion nervous threads radiate in every direction, which are unbranched, of nearly equal sizes, and soon lost in the body (Pl. II. B. fig. 2). The system has obviously a nearer relation to that of some of the lower Molluscans than to any of the typical Annelidans, a fact which, however, is not anomalous, for Prof. Owen has made the same remark in reference to some intestinal worms†.

The circulating system appears to be complete, though very simple. Immediately behind the eyes there may be observed a roundish spot on each side of a reddish colour, indicating the position and figure of organs which are perhaps the centres of this system‡. These organs are connected by a cross vessel ; and from their inferior aspects a fine vessel departs, which, running along each side between

and into Kirby's Bridgewater Treatise, pl. 1 B. f. 4. The comparison may be usefully extended to the *Annelides*, Cyclop. of Anat. and Phys. i. 169. f. 70 ; Roget, Bridgew. Treat. ii. 103. f. 260 ; and to the *Tæniæ*, ibid. ii. 83. f. 247.

* Since this was written, farther observations have almost satisfied me that the apparent differences in the formation of the cæca in these subgenera are dependent, in a great measure, on the state of the worm in regard to repletion,—the distinct vesicle-like spaces being formed by the extension and coalescence of the cæca around a space filled with ova, which would seem therefore to be always exterior to the cæca.

† Proceedings of the Zool. Soc. of London, pt. iii. p. 28 ; and Trans. of the Zool. Soc. i. 328–9.

‡ Dugès appears to have been of the same opinion. Ann. cit. p. 75. Williams takes our view of the functions of these organs : see Rep. 1851, p. 189.

the intestine and skin, encircles the body with a continuous canal of equal calibre in every portion of its long circuit (Pl. II. A. fig. 5). It is uncertain whether these side-vessels are connected by smaller transverse inosculations: I believe they are, and that the pale lines which we observe to cross the body in some species, at short and regular intervals, are produced by these vessels of communication (Pl. II. A. fig. 1). On examining fig. 5, another vessel will be seen winding down the middle, along the surface of the alimentary canal, in an undulating line. That it has any connexion with the centre of circulation or lateral vessels, I cannot affirm, for I could neither trace its origin nor its place of termination, nor can I perceive that any vessel goes from it; but we may be allowed to infer, from its analogy with the *Planariæ**, that it belongs to the circulating, and not to a nervous system. I have never detected the slightest appearance of a fluid in motion in any of the vessels; and were I to call the central vessel an aorta, and to decide that the lateral vessels were for the purpose of returning the refluent fluid to the heart, I might justly be censured for indulging in a fancy which has no observation in its support. We are too liable to assign to the organs of these lower creatures the names of what we deem their analogues in higher classes, and with the name to associate an idea of sameness or identity in their functions,—a propensity which has not seldom led to error.

The *Nemertes* live under stones and in mud between tide-marks: they avoid the light, and love obscurity. They are numerous in individuals, but how they are propagated is yet conjectural. At certain seasons I have seen within the body small roundish oviform grains lying unconnected with any particular viscus, but of the real nature of these, no observation has enabled me to form an opinion. Specimens have also occurred in which there seemed to be the commencement of a separation of the body into two or more parts, but these marks of division might be the effect of injury. The species are very tenacious of life; if cut into several pieces, each lives and moves, and perhaps in time each will grow up to a complete and perfect worm. When placed in fresh water, they show, by instant contortions, how painful and poisonous is this fluid to them. They soon break into pieces, disgorge portions of the viscera, and speedily die and dissolve into a soft jelly.

On the structure of this Tribe, see H. D. S. Goodsir in *Ann. & Mag. Nat. Hist.* xv. 379.

Astemma rufifrons (page 19).

Deposits its spawn in a rope about an inch long, in which the white spherical ova are contained. The young, on their birth, are of an oval form, flattened, begirt with cilia; and they have two black eyes in front, one on each side.—*Dalyell.*

* See figures illustrative of this in Roget's Bridgew. Treat. ii. 250. fig. 346; and in Cyclop. of Anat. and Physiology, i. 653. fig. 327.

When fully stretched out in creeping, this worm is 2 inches long, but very narrow and filiform, or rather tapering to a point posteriorly; it is of a yellowish colour for the greater part, but the anterior extremity is a rose-red, while the apex or mouth forms a dark red speck. When slightly compressed between plates of glass, the intestine may frequently be seen unrolling itself from the circular and terminal mouth in the manner that some annelidans unroll their proboscis. The worm will thus sometimes nearly disembowel itself. The intestine is white, round and filiform, without any appendage.

Cephalotrix lineatus (page 19).

"Very slender. Anterior extremity obtuse, with two black eyes on the surface, near the front. Posterior extremity tapering. Colour universally dark grey, with a white line down the back; anterior extremity, wherein the eyes are seated, white. Motion smooth and gliding."—"A smaller specimen, with similar eyes, but the anterior portion ruddy, I conjectured might be a young animal of the same species."—*Dalyell.*

Cephalotrix flustræ (page 20).

"The body is slender, and the dark line in the centre of the anterior extremity denotes an internal organ. The eyes are very conspicuous, and are seated just at the origin of the anterior pellucid part."—*Dalyell.*

Tetrastemma varicolor (page 20).

Body 1½ inch long, soft, flattened, contractile, narrowed towards the tail, of a yellowish maculated colour, with a dirty greenish intestinal line down the middle. Mouth rounded. Eyes four, placed in a square form and rather distant. The maculated appearance proceeds from white oviform bodies.

Tetrastemma variegatum (page 20).

"Towards the front of the upper surface are four black eyes, set in long quadrangular arrangement: the two posterior are difficult to be seen."—"This animal always ascends the side of its vessel, where it uniformly establishes itself in a horizontal silken tube, close to the surface of the water."—*Dalyell.*

Borlasia* olivacea (page 21).

Of a dusky olive colour, often tinted with purple in front, and paler at the posterior extremity, which is more acuminated than is

* A name given by Oken to the *Lineus* of Sowerby, coequal therefore with the

common in the genus. Body linear and narrow, from 3 to 6 inches long, a line or so in breadth, smooth and compressed. Anterior extremity rounded, obscurely marked with a red spot over the site of the heart. In the 'Zoological Journal' I have described this species as having only two eyes; but as this appears to be a mistake, or at least not constant in the species, it has become necessary to alter its designation.

When pressing a portion of the body between the plates of glass, I have occasionally seen some bodies escape, of a curved fusiform shape, acute at both ends, and marked towards one of them with a pale circular spot. They have shown no signs of life, nor can I say what they are, though it has occurred to me that they may be embryo-young, and that the worms may in fact be ovo-viviparous.

Borlasia octoculata (page 21).

Body linear, narrowed posteriorly, 3 inches long, and about $\frac{1}{8}$th of an inch broad, compressed, of a light reddish-brown colour, with a darker spot in front over the hearts. Eyes six or eight, and in some specimens I have seen seven, three on one side, and four on the other. It appears, therefore, that the number of the eyes, on which Müller and others have reckoned confidently as a good and invariable character, is not to be implicitly relied on.

Borlasia purpurea (page 21).

Worm 2 or 3 inches long, smooth and glutinous. From the darkness of its colour, the spot indicating the position of the heart is scarcely visible until the body has been compressed. The number of eyes is the same as the preceding, and liable to the same variety. In this species the ova were distinctly seen to be contained within the cæcal vesicles, which, when compressed, assumed a pyriform shape, having the slender end toward the intestines.

The young are of a wood-brown colour with a pale hinder extremity. In some of them there are four eyes only. The usual number is six, and when the creature is creeping in the water, they appear like minute miliary or prominent granules on each side. The genital aperture is elliptical, and placed immediately behind the red spot produced by the ganglia. The worm can swim at the surface, slowly, in a reversed position.

Borlasia gesserensis (page 22).

"Length $3\frac{1}{2}$ inches; figure nearly linear; extremities obtuse; six or more black specks around the anterior margin. A slit below in-

Nemertes of Cuvier, equally unnecessary, and as originally applied altogether inadmissible. Because it commemorates a worthy naturalist, Dr. William Borlase, author of the 'History of Cornwall,' I rejoice in being able to affix it to a group hitherto uncharacterized.

dicates the mouth (the genital aperture). Colour universally different shades of green, sometimes tending to brown or pale carnation. Numerous lighter narrow circles, at considerable intervals, with a minute pale speck on the side of each, environ the body, resembling faint annulations. A considerable quantity of glutinous, or almost silky matter is secreted by the body."—*Dalyell.*

Borlasia striata (page 22).

Body linear-elongate, subcylindrical, rather fragile, smooth and even, of a black colour on both surfaces, striated with many equidistant whitish lines, which run parallel from one end to the other. Head continuous with the body, obtuse, with a whitish apex, and a long fissure on each side. Above the fissures, on a whitish space running forwards to the front, there is, on each side, a series of black eyes, about six on each side; but it would be difficult to give the number exactly without destroying the specimen. Visceral aperture large, oval, with a cream-yellow margin. There are seven whitish lines on the dorsal surface, one on each side, more distinct than the others, and three on the ventral surface.

Omatoplea gracilis (page 22).

This worm, when drawn out to its ordinary length, as in the act of creeping, measures about 20 inches, while it is not more than a line in breadth. Body linear or somewhat attenuated at the posterior extremity, compressed, smooth, soft and glutinous, very contractile, of a uniform olive-green colour, lighter on the ventral surface: when viewed through a common magnifier, it is seen to be marked with numerous pale cross lines, and the sides appear lighter than the centre. Head obtuse, rounded in front, tinted with yellow, and dotted with numerous eyes along each side, reaching to the two orange-coloured spots, which are about one-eighth of an inch from the extremity.

Omatoplea rosea (page 23).

Body linear, vermiform, about 3 inches long when extended, but very contractile and polymorphous, smooth, of a uniform cream colour in general, sometimes flesh-red, often dusky down the centre from the opake contents of the intestine, marked with two red spots near the head, anterior to which are the ocelliform specks arranged on the sides in two more or less perfectly separate clusters. The eyes are unequal in size, and about twelve in number on each side. Mouth subterminal. Anus terminal. When compressed, or otherwise irritated, this species has been repeatedly noticed to exude a milky fluid from its whole surface.

There is what I consider to be a variety of this species of a reddish orange colour, with dusky undulations down the middle from the interranea. It is comparatively rare, and the depth of its colour

may proceed from some difference in food, or in its state of repletion. The resemblance between it and the *Planaria rosea* of Müller (*Zool. Dan.* tab. 64. f. 1, 2) is sufficiently great to suggest a suspicion of their identity, but Müller expressly states that the latter is destitute of eyes (see the *Prod. Zool. Dan.* p. 221).

Omatoplea melanocephala (page 23).

Body from 1 to 1½ inch long, narrow and vermiform, tapered at the tail, of an olive or yellowish colour, the latter tint most predominant in front, which is marked with a black spot of a quadrangular form, and four eyes placed nearly in a square. It was in this species that the structure peculiar to the genus was most easily to be traced.

Omatoplea pulchra (page 24).

Body about an inch in length, and two lines in breadth, compressed, narrow, elliptical, the front marked with numerous black specks, irregularly arranged, and visible with the naked eye. Many specimens are of a uniform aurora-red colour, considerably paler on the ventral aspect, while others are beautifully marked along each side with a series of large scarlet spots; the former are perhaps males, or more probably individuals in a barren condition, while the others seem to be full of mature ova, for an examination of the spots through the microscope shows that they are produced by clusters of oviform bodies lying in the interstices of the cæcal appendages.

This and the first species contrast remarkably in their form, and show the extremes to which this character is subject. The structure of the stomach is like that of its congeners, excepting in there being five or six spines on each side of it, instead of three, which is the usual number. Immediately under the hearts we observe a large, somewhat muscular viscus, apparently hollow, and lying in the course of the intestine, but seemingly unconnected with it; for in the individual examined, the intestine had been extruded from the body, and entirely expelled by the contortions of the worm produced by impure sea-water. Of its office and nature I can offer no opinion, but I may remark that in all the species a greater duskiness in its site shows that a similar organ exists in all.

Stylus viridis (page 24).

"The spinous prolongation is a spontaneous protrusion, that is, it can be retracted completely, especially when the animal is at rest; and when gliding along, it is drawn out to the slenderness of a human hair, actually becoming invisible from extreme tenuity without a lens, or being placed on a black ground. This prolongation is very flexible, forms various curvatures, and displays peculiar action independently of the body."—*Dalyell.*

Stylus purpureus (page 24).

"A fine specimen, about 8 inches long, had the spinous prolongation extending about a quarter of an inch. This prolongation appeared somewhat muricate under the microscope. Another specimen, 4 inches long, was of a deep red purple, all except the anterior margin, which appeared yellowish. Its prolongation rather exceeded a quarter of an inch. A thin specimen extended about 3 inches, and the prolongation half an inch more. The colour of the anterior part was dark purple, but about fifteen lines of the posterior, including the prolongation, pure white. This latter portion had been undoubtedly a reproduction, as its commencement proved somewhat smaller than the dark part, which was nearly two lines thick. The specimen came from Shetland. It must have been large originally. Very faint circles were just perceptible on the body at considerable intervals. In certain positions there is an indistinct appearance of annulation in some of this flattened race."—*Dalyell.*

Stylus fragilis (page 24).

This species forms a very slight silken sheath. The head tapers almost to a point when the animal is in motion. "In quiescence, the lower portion was much broadened. One or more enlargements seemed often passing down the whole body from the anterior extremity."—*Dalyell.* Brittle.

Stylus fasciatus (page 24).

The anterior extremity is obtuse, "cleft by a groove; posterior extremity terminating in a spinous prolongation. Mouth (genital aperture), a slit in the under surface of the anterior extremity. Upper surface with two large black specks in front, and several smaller ones behind them. Colour from light orange to reddish; the body encircled by a number of white belts. Margin of the anterior extremity white."

"In this species the spinous prolongation bears a great proportion to the length of the body, sometimes being equal to a fourth part of it; and it is so flexible, that small specimens seem almost capable of casting a knot on it. The number of belts is irregular, nor do I know that they indicate anything but merely a diversity of colour."—*Dalyell.*

Lineus longissimus (page 25).

"It seems some very 'low' Ascarid or Planarian worm. You see it? That black, shiny, knotted lump among the gravel, small enough to be taken up in a dessert-spoon. Look now, as it is raised, and its coils drawn out. Three feet—six—nine, at least, with a capability of seemingly endless expansion; a shiny tape of living caoutchouc, some eighth of an inch in diameter, a dark chocolate-black, with paler longitudinal lines. Is it alive? It hangs helpless and

motionless, a mere velvet string across the hand. Ask the neighbouring Annelids and the fry of the rock fishes, or put it into a vase at home, and see. It lies motionless, trailing itself among the gravel; you cannot tell where it begins or ends; it may be a dead strip of seaweed, '*Himanthalia lorea*' perhaps, or '*Chorda filum*;' or even a tarred string. So thinks the little fish who plays over and over it, till it touches at last what is too surely a head. In an instant a bell-shaped sucker mouth has fastened to his side. In another instant, from one lip, a concave double proboscis, just like a tapir's (another instance of the repetition of forms), has clasped him like a finger; and now begins the struggle: but in vain. He is being 'played' with such a fishing-line as the skill of a Wilson or a Stoddart never could invent; a living line, with elasticity beyond that of the most delicate fly rod, which follows every lunge, shortening and lengthening, slipping and twining round every piece of gravel and stem of sea-weed, with a tiring drag, such as no Highland wrist of step could ever bring to bear on salmon or on trout. The victim is tired now; and slowly, and yet dextrously, his blind assailant is feeling and shifting along his side, till he reaches one end of him; and then the black lips expand, and slowly and surely the curved finger begins packing him end-foremost down into the gullet, where he sinks, inch by inch, till the swelling which marks his place is lost among the coils, and he is probably macerated to a pulp long before he has reached the opposite extremity of his cave of doom.

"Once safe down, the black murderer slowly contracts again into a knotted heap, and lies, like a boa with a stag inside him, motionless and blest."—*North British Review*, no. xliii. p. 38.

Specimen 14 feet in length, from 2 to 4 lines in breadth, linear-elongate, exannulate, flattened, very smooth, soft and slimy, of a uniform reddish-black colour. Head distinct, about $\frac{1}{4}$ of an inch long, like that of a serpent, white on the front margin, and marked with three whitish lines down the vertex, slit on each side so as to form a furrow there more or less distinctly defined, according to the contractions of the worm. Mouth large, inferior, in the body behind the head, forming a longitudinal slit when closed, but when open a wide roundish aperture, with a fleshy pink folded lip interrupted anteriorly. Body immaculate, variously entwined and twisted, with a faint whitish line running from the hinder angle of the cephalic groove along each side to an uncertain length, and soon disappearing; ventral surface a shade lighter than the back; posterior extremity somewhat rounded and attenuated. There seems to be an aperture in the posterior angle of each cephalic groove.

When left to die in sea-water, the body ruptures in a few, and then in many places, exposing the white or pink interranea; and often a portion of the intestine of several inches length is extruded, looking like another worm among the folds. This intestine is as thick as ordinary twine, cylindrical, and of a pink colour. At the broken place the body soon separates into pieces and rapidly dissolves. In ordinary circumstances the worm is not brittle.

"It is especially during night that the Sea long worm unfolds

whole yards of its unmanageable sinuosities in quest of food, or for change of shelter, while its lesser fellows abandon their secret haunts, as if to recreate themselves from the tedious restraint which the presence of light has imposed upon them. Whether it be for obtaining sustenance,—whether, if such be their nature, to seek a mate,—whether to construct some curious edifice, whereof Heaven has made them the innate architects,—or be it merely to sport amidst the waters,—night is alike the season for excursions of enjoyment and occupation, whereas the day of the upper world is devoted to rest. Nay, so inherent is this instinctive nature, so evident this peculiarity, that the sun has scarcely passed the meridian, when certain tribes begin to betray their restlessness, and seem ready to put themselves in motion."—*Sir John G. Dalyell, Pow. Creat.* i. 41.

> " —— as she were waxed mad,
> And in meandered gyres doth whirl herself about,
> That, this way, here and there, back, forward, in and out;
> And like a wanton girl, oft doubling in her gait,
> In labyrinth-like turns and twinings intricate."
>
> " There, as a line, their long dimension drew,
> Streaking the ground with sinuous trace; not all
> Minims of nature; some of serpent-kind,
> Wondrous in length."—Milton, *Paradise Lost*, Book 7. p. 19.

Lineus gracilis (page 26).

Body cylindrical, of a dark umber colour with the exception of a few narrow longitudinal white lines. The anterior portion is corrugated transversely; it is almost $\frac{1}{2}$ an inch in breadth, and tapers from this very gradually to the terminal extremity. The anterior extremity is slightly quadrilobate, and in the centre there is a small foramen, through which a long, narrow, extensile, trumpet-shaped proboscis can be protruded at the will of the animal. On each side of this are two narrow longitudinal slits similar to those in *Serpentaria*. The edges, however, are more rounded, and consequently not so closely applied to one another. The fissure behind, on the abdominal surface, is small and rounded.—The power of dividing the body spontaneously is not great.—*H. D. S. Goodsir.*

Lineus lineatus (page 26).

Body flattened, thick, linear-elongated, narrowed posteriorly, even and smooth, of a uniform blackish-green colour on both surfaces, excepting that the venter of the posterior part is sometimes ochre-yellow. Head distinct, and separated by a stricture, small, quadrate or semiovate, with a deep fissure on each side, a medial groove down the vertex, and a shorter one opposite on the ventral side touching the lip, where the four lines make a crucial figure. Rim of the mouth white. Genital aperture large, ovate, with or without a pale margin. Length 3–5″; breadth 6‴; thickness 2‴.

Specimens in spirits are wrinkled and rugose, with numerous very

narrow annulations. There is, in some specimens, a faint white line on each side, and a third on the back; but these are not constant, nor do they extend far down the body. The head appears to be partially retractile within the part below it. The body is firmer and less fragile than *Lineus longissimus*, and less glutinous.

Lineus fasciatus (page 26).

Body linear-elongate, nearly cylindrical, often appearing as if it had been twisted, alike on both surfaces, smooth and glutinous, blackish-brown inclining to wood-brown posteriorly, lineated with several paler, parallel, narrow fasciæ; the number varying from five to seven. Head ophiocephalous, defined behind by the lateral fissures, which are very distinct, longer than broad, the front emarginate, with a white border continued backwards on a line above and parallel with the fissures. Intestine white or very pale rose-tinted. Length 1–2′; breadth 1–1½‴. (v. v.)

Hab. The coralline region. Berwick Bay, April 18, 1855.

Lineus viridis (page 27).

"The head is distinguished by a groove, as that of the *Gordius maximus* (*Lineus longissimus*), and, like it, the mouth is a longitudinal slit in the under surface of the anterior end. Colour universally green; darker on the upper surface, paler below."—*Dalyell.*

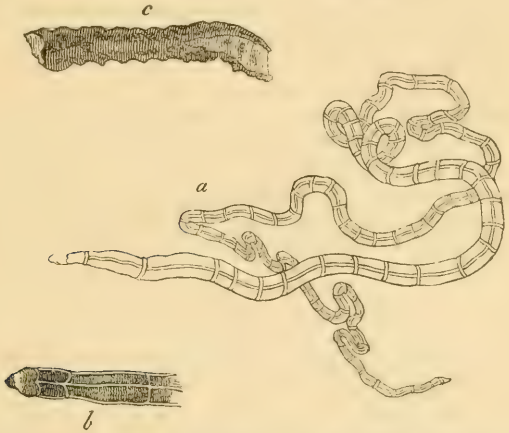
Feeds voraciously on mussel. Spawns principally in spring; the spawn in the form of gelatinous ropes of about 2 inches in length, and about a line in diameter.

Meckelia annulata (page 27).

Meckelia annulata has, among worms, considerable pretensions to superior beauty. It is of a hyacinth-red colour, marked with three very distinct, pure white, longitudinal lines, one running down the middle and one along each side, and crossed with numerous lines of the same colour which encircle the body and mark the number of its segments. Besides these more obvious lines, a fainter one is usually observable across the middle of the segments; and the greater portion of the worm is speckled on the sides with white dots, too small to be seen unless with a magnifier. The ventral surface is of the same red colour as the dorsal, but wants the white line down the middle. The body is soft, vermiform, flattened, gradually narrowed, posteriorly distinctly annulose, about a foot in length, and one-eighth of an inch in breadth, when at rest; but capable of being drawn out to three times this length, when, of course, it becomes proportionally attenuated. It has neither tentacula nor bristles, nor feet of any sort; neither could I perceive pores in the margins or ventral surface. The head is formed of two segments which are shorter than the others; and the anterior is marked with a white band, and

rounded at the tip, where a small slit marks the situation of its toothless mouth. There are no eyes. The third and fourth segments are elongated, but the others are nearly equal, being, when at rest, about one-eighth of an inch in length and in breadth; the pro-

No. XLVIII.—*Meckelia annulata.*



a. Natural size, and in a state of quiescence. *b.* The head slightly magnified and shaded, to show the lateral pale lines. *c.* A small portion of the tube.

portions, however, varying much according to the degree in which the body, or particular portions of it, are extended. When magnified, the margins appear finely crenulate. The anus is simple and terminal.

Meckelia annulata was found within a coarse tube attached to an old valve of the *Venus islandica* of British authors. The tube was about 4 inches long, formed of a membrane, smooth, and iridescent internally, but coated on the outside with gravel and pieces of broken shells, and open at both ends. I have found a very different worm in a similar tube; so that a doubt may, perhaps, be entertained, whether the *Meckelia* fabricates it of itself, or is merely a tenant at will. From the body being distinctly annular, the worm is brought in contact with the Annelides; but its softness, the want of feet or bristles, the apparent simplicity of its structure, and its resemblance to the tapeworms, and more especially to the *Lineus longissimus* of Sowerby, favour its claim to be placed among the *Vermes*.

Another, and a very fine specimen, was of a chocolate-red colour, tinted purplish-red on the sides, and the ventral surface was of the latter colour throughout; but the most remarkable difference was that there was a white line down the middle of the belly as distinct as that down the back.

All the specimens seen by Sir J. G. Dalyell had the abdominal white line. This is exactly opposite the dorsal line, so that the lines divide the body longitudinally into four equal spaces. The worm is,

undoubtedly, "one of the most remarkable among the tenants of the deep. It is a genuine snake in miniature, of delicate form and proportions, decked in lively colours." These colours are red and white finely contrasted,—the red usually scarlet or vermilion, but sometimes chocolate-red. The worm "forms a pale grey, thick, glossy, silken sheath of considerable tenacity, reflecting the prismatic colours even in artificial light. Although of ample width, the sheath does not exceed a sixth part of the animal's length. Herein it reposed in unequal parallel longitudinal folds. The sheath is sometimes abandoned, either transiently or permanently, or its occupant wanders about the vessel, and returns to lie there during weeks, protruding the head occasionally. This covering is probably formed by an exudation, very profuse, from the whole or part of the body. Not only do its sides appear to be thickened by successive augmentations, but the tenant repeatedly forsakes the old sheath to form a new one, which in turn is deserted also."—*Dalyell.*

Meckelia tænia (page 28).

"Length 16 inches or more; breadth of the anterior above a line. The head and sides of the anterior cleft. Mouth (genital aperture) a slit below, very conspicuous. Colour from dull reddish-brown to pale red; belly paler. A white stripe traverses the whole length of the back, which is divided in the centre by a dark line, thus rendering the animal very like a riband." No specks or eyes have been discovered. The extremity of the anterior is white.

"This animal takes shelter in empty shells, or in the tubes of other tenants of the deep."—*Dalyell.*

Serpentaria fusca (page 28).

Body linear-elongated, flattened, nearly alike at both ends, or narrowed posteriorly, the ends bluntly pointed, entire; back rather convex, of a uniform or marbled umber-brown colour, the ventral surface of a faint flesh-colour or ochre-yellow. Substance opake, of a firmish consistence, but very glutinous. Head continuous with the body, without eyes or fissures. Mouth rather large, round and puckered; genital aperture round, comparatively small. Posterior end rather more pointed than the oral.

The body of this fine species, in spirits, has an obscure wrinkled appearance, as if it were composed of very narrow annuli. It is fragile, so that it is difficult to procure an entire specimen. The specific name *bicolor* would have suited it better than that adopted, for the back and venter are well marked, and defined by the contrast in their colours.

Order II. BDELLOMORPHA, *Blanchard* (page 30).

On the structure of this Order see the "Mémoire sur l'organisation des Malacobdelles," par M. Emile Blanchard, in Ann. des Sc. nat. sér. 3. iv. 364, and xii. 267-276. A short and imperfect notice of the latter is inserted in Ann. & Mag. Nat. Hist. ser. 2. vi. 147. No hearing. Food the juices of other animals.

Fam. II. CAPSALIDÆ (page 32).

"Ainsi que les zoologistes pourront s'en apercevoir par les caractères assignés ici à ce groupe; ainsi que je l'ai déjà indiqué dans les considérations générales, les Tristomiens sont, de tous les Trématodes, ceux qui se rapprochent le plus des Aporocéphales. La position de leur bouche, et surtout celle des ganglions cérébroides, est un acheminement vers cette disposition si remarquable et si caractéristique chez les Planariées."—*Blanchard in Ann. des Sc. nat.* viii. 321 (1847). I had long previously expressed the same opinion.

Nitschia elegans (page 33).

"Ce Tristome est long de 12 à 15 millimètres, et d'une nuance rougeâtre. Il est allongé avec ses côtés parallèles, seulement un peu élargi en avant, et arrondi en arrière. La bouche est notablement éloignée du bord terminal. Le bulbe est épais avec ses bords légèrement prolongés en pointe. Les ventouses antérieures sont très étroites, et linéaires. La ventouse postérieure pédonculée, extrêmement grosse, et en forme de clochette profonde, est bordée d'une membrane plissée, et comme festonnée. Le pénis est situé notablement en arrière de la bifurcation de l'intestin, presque sur la ligne médiane. L'oviducte débouche un peu en arrière."—*E. Blanchard.*

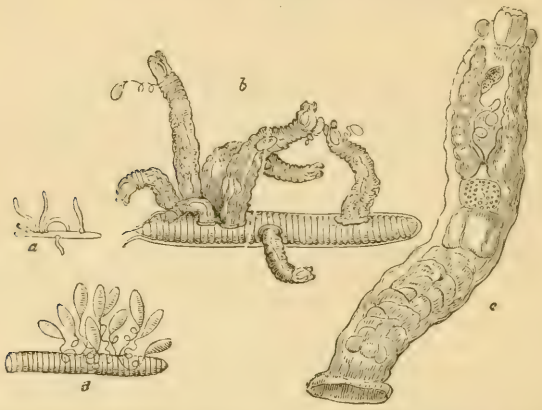
Udonella Caligorum (page 34).

The Leech adheres by its sucker to any part of the body of the Crustacean, and often fringes the sides, or hangs in clusters from the caudal filaments, waving and contorting itself like a worm in pain. I have not seen it voluntarily leave its hold, but it may be removed without difficulty or injury, when it lies very helpless in the basin, and apparently incapable of progressive motion. In its structure it seems allied to some intestinal worms, but from its habits there is reason to locate it among the *Hirudines*, although it should be remarked that the *Caligus* did not appear to have become thin and exsanguinous, and swam about with its load of blood-suckers with great activity, indifferent to their wrigglings and annoyance.

Udonella Caligorum is about four lines in length, and scarcely one

in breadth, of a milk-white colour, subpellucid, subcylindrical, contractile like a worm, soft, without limbs or processes; but when magnified, the margins appear crenulate, from the skin being drawn into circular wrinkles. The anterior extremity is truncate, with a sort of thickened wart at each side. The mouth is inferior (not terminal), forming a longitudinal slit, from which there is occasionally

No. XLIX.—*Udonella Caligorum.*



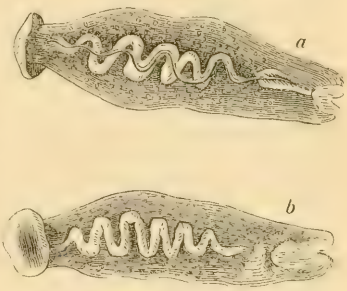
a. Natural size, attached to a portion of the caudal filament of the *Caligus*.
b. The same magnified.
c. A single specimen compressed between plates of glass, and highly magnified; the proboscis is thrust out of the mouth and forwards.
d. A cluster of ovaries magnified.

extruded a very short thick proboscis plaited round the rim, but edentulous; and the sucker at the posterior extremity is circular, cupped, and plain. If the body is now slightly compressed between plates of glass, we perceive near the middle a clear circular spot or viscus, containing translucid granules, and immediately under this there is another bag or viscus, about twice the size of the former. The largest appears to be the stomach; and the intestine is seen obscurely to form numerous convolutions in the space between it and the sucker; but their particular course and termination could not be traced with any degree of accuracy. Half-way between the mouth and the first circular spot, there is an opake irregular mark, which gives origin to the ovary, and which can be easily seen attached to a vesicle in this spot, by its thread-like twisted pedicle. I have never seen more than one of these in the same body, and I have seen it extruded through an aperture at the side of, or near the mouth, as is shown in two of the individuals figured. The ovaries are oval or pear-shaped, and are filled with a granular matter; they are attached in clusters to the body of the *Caligus* by their pedicles, and may usually be found in great numbers.

Malacobdella grossa (page 35).

Body $1\frac{6}{10}$ in. long, about $\frac{6}{10}$ths of an inch in breadth where broadest; oblong, flat, soft, exannulose, roughish, with little granulations, and of a uniform flesh-colour. On the upper side a small vessel is seen distinctly running down the middle of the body, having a tortuous course, and terminating near the sucker; and it lies over a much larger intestine, following the same direction, and alone visible on the ventral aspect. The anterior extremity is rounded, somewhat raised above the mouth, which is placed in a sinus here, and opens chiefly on the under side; it is wide, edentulous; but, when opened, the inner surface appears flocculent, being clothed with longish papillæ, which are arranged in close longitudinal series, and cover the whole intestinal canal. This organ is nearly of uniform width and structure throughout; but the papillæ appear to be longer towards its termination, which is by a small aperture on the back, just above the sucker. The dorsal vessel begins in a sort of swelling above the mouth; and, after it has passed beyond the middle of the body, it becomes sensibly attenuated. It is not fibrous, and, indeed, exhibits no marked structure beyond a very fine and faint reticulation of the surface when exposed under a high magnifier. The space between the intestine and margins of the body is compactly filled with myriads of oviform bodies, which seem to lie, without any particular order, in a gelatinous fluid: they are roundish, opake, and encircled with a rim or pellicle of transparent jelly.

No. L.—*Malacobdella grossa.*



a. Upper side. *b.* Under side.

I have twice found this leech in specimens of *Cyprina islandica* dredged up in Berwick Bay. They were lurking between the cloak and branchiæ, and doubtless had sought out the site for a less harmless purpose than shelter from foes; but, so far as I could judge from external appearances, the oyster had not suffered any material injury.

On the suggestion of Lamarck, it has been here considered a species of *Phyllline*; but it will not correspond with the character of the genus, for the large terminal disk or sucker is not armed with hooks, as Lamarck's definition expresses, but is quite smooth. Nor has the skin the slightest appearance of circular rings, or rugæ, even when contracted and hardened by spirits; and its whole anatomy is so unlike that of Annelides, and more especially of the true leeches, that it strengthens an opinion of Lamarck's, of there being a class of animals, yet unestablished, between the Annelides and the worms.

Malacobdella Valenciennæi (page 35).

I have seen a specimen taken in *Mya truncata*, from the Firth of Forth, by Dr. P. W. Maclagan; but, confounding it with the preceding, I made no description. Neither did Blainville discriminate them. He says it is 10–12 lines long by 5–6 in breadth; and the intestinal canal was much less wavy than it is represented to be by Müller in *M. grossa*.

The following is a translation of Blanchard's description:—"This animal is about 4 centimetres in length, and, at the middle, it is from 8 to 10 millimetres in breadth. The colour of the skin is yellowish-white, semitransparent, permitting the intestinal canal to be seen, the colour of which, beyond the œsophagus, is ochre-yellow. The dorsal vessel is distinguished by its whiteness on this coloured intestine; and the cerebral ganglions, of a yellowish tint, are also distinguishable through the integuments. The oral aperture is a simple triangular fissure. The anus is round. The sucker is very large, thin, and flattened."

Pontobdella muricata (page 39).

"The firm adhesion of the sucker to the skin of its prey must render this animal a cruel and inveterate enemy."—*Dalyell.*

This leech has always appeared to us a sluggish animal, lying at the bottom of the containing vessel as if it were half-dead, and contracted into an imperfect semicircle*. But Sir J. G. Dalyell, who was remarkably careful of his specimens to keep them in a living condition, found that, although torpid in solitary confinement, it raised itself to activity on the introduction of a companion. "Their necks are intertwined, considerable activity is displayed, and one or more milk-white vesicles, resembling minute grains of oats in figure, are seen protruding from the neck or its vicinity. Some observers have represented a leech, apparently the *muricata*, with horns. Have they been deceived by the vesicles?"

Pontobdella verrucata (page 40).

This leech is from 4 to 6 inches in length, and about as thick as a man's little finger. Specimens preserved in spirits are of a cream-yellow colour, with a dusky shade; but the animal is blackish-green when alive. The suckers are large, thick, and muscular. There are generally six tubercles on the rim of the oral one, but these are

* "During the day this singular leech reposes in absolute quiescence, but towards evening, its wonted coil relaxes in wider curves, and it rears itself erect on the plane of position, with the head turned inwards. The quiescence of a solitary specimen, however, is interrupted by the introduction of stranger leeches of its own kind; their society is evidently gratifying. Five having been collected in the same vessel, all began to intertwine their necks together after fixing the sucker; they stretched and curved, or contracted the body, yet without shifting from their respective spots of adhesion. Such movements continued for hours." —*Dalyell.*

not always present; and the outer surface is either rugose or smooth. Moquin-Tandon says that in *P. verrucata* the separating ring is broader than those of the sets, and gives this as a part of the specific character; but this is not the case in my specimen. However, in *P. verrucata* the division into sets is more obvious than in *P. muricata*. The breadth of the rings varies according to the conditions under which the leech has died, and affords no character. The form of the papillæ seems alone to distinguish the species. In *P. muricata* they are prominent, rigid, and pointed, with the apex roughish with spinules; in *P. verrucata* they are much less elevated, with a broad shield-like base, and a papilla in the centre; and they are less crowded than in *P. muricata*. The difference does not seem to be specifical, and hence I include both species in these observations. There is no very perceptible difference between the dorsal and ventral surfaces.

The observations of Dalyell are much in favour of the opinion that there is only one species. It lays its ova within stalked capsules which are attached to old shells, &c., and usually in groups. "The capsule consists of a sole, a short stalk surmounted by a spheroid, with a distinct umbo on the side. The capsule altogether is about three lines, and the spheroid which contains the embryo, or leech, about two in diameter.—Such capsules are firmly agglutinated by the sole to the substance whereon they are deposited. They are originally white, or of the faintest carnation, of a fine soft downy aspect, with the neck orange or yellowish. They darken gradually from the time of production, and in four or five days the original white is converted to olive-green, or dull wax-yellow. They are produced singly, free of all gelatinous matter."—(p. 6.)

"The capsule consists of a coriaceous, tough, thick integument full of tenacious, albuminous, brownish matter. It contains only a single embryo, which penetrates the lateral umbo in issuing forth to the light. Then the young animal is about an inch in length."—(p. 7.)

It deposits the capsules chiefly during summer.

Pontobdella lævis (page 41).

Hab. "Obtained alive in April 1838, either at Portpatrick or Donaghadee, by Capt. Fayrer, R.N., who commanded the mail steam-packets between these ports."—*W. Thompson.*

"Corps en longue massue, très-atténué en avant, et se renflant peu à peu jusque tout après de l'extrémité postérieure, lisse, et même sans articulations distinctes; ventouses terminales: la postérieure fort petite; l'antérieure assez peu considérable, sans traces de verrues tentaculaires, ni de points pseudo-oculaires; orifices des organes de la génération très-antérieurs, au premier sixième environ; anus fort petit; couleur d'un brun roussâtre."—*Blainville.* To this description Blainville adds that his specimen was given to him by M. Paretto of Genoa. It was, although preserved in spirits, upwards of half a

foot in length; and, as it had altered a little, the colour and the entire smoothness of the species cannot be positively affirmed. But Mr. Thompson's specimen, on which no alteration seems to have been produced, was smooth all over the surface. It was 4 inches in length.

Pennant, in his description of the Basking Shark, says,—"The fishers often observe on them a sort of leech of a reddish colour, and about 2 feet long, but which falls off when the fish is brought to the surface of the water, and leaves a white mark on the skin."—*Brit. Zool.* iii. 139.

Pontobdella campanulata (page 42).

"Length, when extended, 13 lines; body round; diameter about half a line. The anterior extremity dilates as a very broad disk, somewhat like a flattened hand-bell; the posterior extremity dilates in the same manner; sucker very large proportionably. Colour of the body dark olive, finely speckled with yellow. Disk and sucker very pale."—*Dalyell*, p. 12. Extremely restless.

Pontobdella littoralis (page 42).

Body one inch in length and a line in diameter, slightly tapered forwards, terminated at each end with a plain circular sucker, of a uniform chestnut-brown colour, or red and mottled (for the colour varies according to the intestinal contents), smooth, rather soft and compressed in extension; the margins minutely crenulate under a magnifier.

The segments are very obscurely marked, but they are divided by circular lines which make the body appear crenulate under the magnifier. The sexual pores are near the outer extremity, and a little protuberant.

Plate II. C. fig. 4. *P. marina*, of the natural size. 5. The same magnified. 6. An outline figure drawn from an individual which had the genital organs extruded.

Hirudo vittata.—"Length above 2 inches; breadth 3 lines; thickness 1 line; body flattened, smooth upper surface, slightly convex. Anterior extremity formed as a cup, occasionally flattening, and applying like a disk to other substances; posterior extremity broad, thin, and large in proportion to the animal, employed as a sucker. That of a very large specimen of the *Hirudo vittata*, one extending 8 or 9 inches, was of smaller diameter. The body is chiefly whitish and speckled, somewhat transparent, so as to expose ten pairs of cells within. Ten projections, like hemispherical blisters, border each side of the animal, rising and falling as if by respiration; no eyes could be found.—It generally remains erect on the broad or adhering sucker, often waving to and fro."—*Dalyell*, p. 9.

The capsules are sessile, nearly hemispherical, about one-third of

a line in diameter, and of a dingy yellow colour, and with a mark on each side.

PISCICOLA (page 42).

M. de Blainville says of this genus that there are only four ocular points in two pairs; Moquin-Tandon says eight, "réunis par paires et disposés en trapèze,"—the peculiarities, perhaps, of distinct species, and not generical. It is, indeed, evident that the character assigned to the genus is derived from one species only; and it ought to be made more general. Tandon says the body consists of 63 rings, which is again clearly a specific character. Blainville finds in a species a median band of very minute horny hooks on the ventral surface, and he makes this character generical; and Moquin-Tandon introduces it with a query as to the correctness of the observation.

M. Gervais asserts that the ocular points or specks on the anterior extremity and on the tail of this species are precisely identical in structure!—*Ann. des Sc. nat.* vii. 56 (1837).

Piscicola percæ (page 43).

"It differs from the *P. geometra* of Linnæus in many particulars; among others, in having the disk with 14 rays and dark points."—*Templeton.*

Nephelis octoculata (page 44).

The young are greyish, pellucid, with dusky interranea, forming an ill-defined fascia along each side. The sides are then very minutely and neatly crenulated.

This leech is active. I have rarely found it at rest*. It moves exactly in the same manner as the horse-leech, and, like it, swims in the water by an undulatory or serpentine motion of the body. It is found on and under stones, and often on plants. Müller says that it swallows microscopical animalcules; and he has frequently seen it devour the shelled mollusca that are the common inhabitants of the same waters. Johnson tells us that it feeds on small "earth-worms," which it swallows whole. We presume Dr. Johnson intends the small worms which used to be referred to the genus *Lumbricus*, and which are strictly aquatic. The structure of the mouth apparently unfits our leech for eating solid food, or biting through a skin; but Sir John Dalyell says, "it is a fierce, active, and voracious creature; feeding greedily on flesh, and even waging a destructive warfare against its own tribe." "In the natural state it seems to subsist also on the succulent plants, and on decaying wood, but always preferring animal substances."

The *N. octoculata* is oviparous; and it affixes the capsule, which

* Dugès tells us that it will often remain for hours, or even entire days, fixed by its posterior sucker, waving and keeping the body, slightly flattened, in a constant undulation,—apparently to renew the water in contact with the surface, and aid respiration.

contains and protects the ova, on submerged stones and plants. This capsule was first described by Linnæus under the name of *Coccus aquaticus* (*Faun. Suec.* p. 220). Bergmann first ascertained its real nature; and Linnæus, much to his own surprise, confirmed the truth of Bergmann's discovery by personal observation. The capsule was viewed, however, as an egg of an anomalous character*, and the correcter view grew up with a more correct or precise physiology. The leech deposits it throughout the summer months, each individual doing so several times; and Dr. J. R. Johnson refined too much, and was wrong, when he limited the deposition of the ova to two periods of the year,—the months of July and October. The capsule contains from six to twelve ova imbedded in a gelatinous mass. These ova go through the various stages, and the young—like to the parent except in colour—escape from the capsule in from 30 to 70 days from its deposition, the period being regulated, principally, by the temperature of the water.

Dr. J. R. Johnson gives the following account of the production of the ova and capsule:—The leech attaches itself by the posterior sucker, and becomes constricted both above and below the clitellus. In a short time this part becomes of a milky-white colour from the formation of a film or membrane, into which the animal forces, with some effort, the whole contents of the uterus. This done, the individual elongates the anterior portion of the body, and thus loosening the enveloping membrane, withdraws its head from it, as from a collar. "In some instances, when this membrane cannot be readily detached, I have observed the animal to bend back its head, and then taking it in its mouth, and drawing it gently, is thus enabled to remove it. From the first formation of this membrane or capsule, to its removal from the body, twenty minutes usually elapse. It is, at this time, very elastic, and of no determinate figure. After the *Hirudo vulgaris* has firmly fixed it to some surrounding substance, it fashions it with its mouth, until it presents an oval form."—"It afterwards returns once or twice to survey it, when all farther notice of it ceases."—The capsules are at first greyish-white, but in ten or fifteen minutes change to an amber colour. They differ much as to size, but are usually about three lines in length and two in breadth, convex above and flattened beneath. The dark points mark the openings left in the capsule by the manner in which the leech deposits it, and are those places from which (the resistance there being less than in any other part) the young escape. Previous to their birth "it is not a little amusing to witness their exertions to escape from their imprisonment. They contract themselves, as it respects their length, into as small a compass as possible, and then forcibly push forward the head, butting, as it were, at the dark point of the capsule, to effect their escape. After many efforts, they succeed in

* "In the animal kingdom there has indeed been discovered a leech (*Hirudo octoculata*), which produces one egg, and from this proceed eight, ten or more young. But it may be questioned whether this is really a single egg, or whether it is not several connected together by some mucilaginous matter. In plants there is no instance of this known to me."—*Willdenow.*

making a small opening, through which they endeavour to force a passage. I have frequently watched them, the head having free motion without the capsule, using their utmost exertions to free themselves; but not being able to accomplish this, they have returned to their former situation, renewing their efforts occasionally, until their object was attained."—"At the time of birth they are nearly colourless, and continue so for many months, with very little increase as to size. They have the property of moving on the surface of the water, with their belly uppermost. I have noticed nothing of this nature in these animals when fully grown."

Aulostoma gulo (page 46).

Aldrovandus says, that in England this species is called "Blud-sucker, Horseleche, vel Horselich, quod medeatur equorum cruribus: nam Horse eisdem equus est: alii Lonuch Leache, Eliota anglus scribit Horseleache, vel Blud Sucker."—*De Insect.* lib. vii. p. 721.—It continues to be called the Horse-Leech, and the vulgar retain also the belief that the bite of it is venomous. Watson doubts the venomous power of this leech. On the contrary, following his preceptor Dr. Duncan (*Edin. Disp.* 463), he believes it might be used as well as the medicinal leech, "nisi quod imposita cutem atrocius vulnerat, et ad exugendum sanguinem alacrior est," p. 13.—A candidate for the Doctorship, it might have been presumed, would have tried whether this was a fact or not; but it was easier to copy. And so we are frightened with a tale that this leech adheres so firmly to the limbs of boys—no doubt boys' blood is sweet—swimming in its haunts, that it cannot be removed,—nay, the creatures may hide and bury themselves in the skin, &c.—I have wondered how it comes that French naturalists should quote this Thesis, which is really below the average value of these productions, and is of no value.

"Horsleches are wholesome to drawe foorthe foule blood, if thei are put into a hollowe rede, and one of their endes cutte of, whereby the blood maie run forthe."—*Bullein, The Booke of Simples*, fol. lxxxix.

They believe, moreover, that the worm cannot be detached from the skin of any victim; and as their creed teaches them that the blood flows from the posterior aperture as quickly as it is sucked in by the mouth, danger and death are to be dreaded. The origin of this belief is easily traced. There was (and is) a yearning wish, long cherished with holy men, to identify every animal mentioned in Scripture with some one that was familiar to them, and could be readily referred to in illustration of the text; and hence our harmless and insignificant worm stood as the representative of the horse-leech which "hath two daughters, crying, Give, give!" But the horse-leech, which had such attributes assigned to it, and which I have been censured for questioning, is unable to bite and draw blood. It is, however, a cruel and greedy worm, feeding on earth-worms, grubs, snails, other leeches, and on its own species, as Willoughby long ago

mentioned. Dr. J. R. Johnson says, that it will swallow almost anything presented to it.

In the writings of medical authors there is much said of the danger of swallowing leeches,—one would imagine not a likely accident, nor did I ever hear of one that could be authenticated. I find in the "Daily News" for March 19, 1847, the following paragraph:—"A farmer in Ruthwell, Dumfriesshire, lost about half a score of sheep lately, and on examination being made of the cause of death, it was discovered that the intestines contained a number of loch or horse leeches. These animals had probably been swallowed by the sheep when drinking, and appeared to have eaten through the coats of the stomach, until they reached a vital part, whereby death was produced. Mortality among sheep has been very prevalent in this district; one farmer in the neighbourhood of Annan has lost 40 sheep, and another 30 this season."

When fully extended the horse-leech is about 4 inches in length, linear-oblong, a little narrower in front, flattened, of a uniform dark olive-green colour, or almost black, the ventral surface a yellowish-green. The body consists of numerous narrow rings which render the margins crenulate. The head is rounded, but not dilated; and on the vertex there are ten eyes arranged in a semicircle: the anterior pair are larger than the others and more approximated, and the posterior pair are placed rather wide asunder, thus:—

The mouth has a strong muscular plicated gullet with three small cartilaginous teeth, forming as it were summits to as many of the plaits. The anal sucker is circular and entire.

There are a few black spots both on the back and belly, but they are very irregular, and sometimes obscure or wanting. In some individuals the ventral surface is scarcely different in colour from the dorsal, and in these a pale yellowish line marks the edge of the body. The leech seems always on the look-out to escape from its confinement in water; and it is oftenest found under stones just above the water-line of its pond. It moves by stretching the body to the utmost from the anal sucker by which it has anchored itself, attaching the mouth, and then dragging the body onwards, without raising it much above the surface. It swims with grace and ease in the water like an eel. It exudes a sparing quantity of a whitish mucus. On being immersed in spirits the belly becomes of a much brighter yellowish-green, but it does not tincture the fluid.

"This is an active, bold, and clever animal, frequently crawling out of the water, and apparently always ready to quit its vessel. None of the tribe surpasses it in voracity. Few animal substances are rejected. All kinds of fish, dead or alive, seem acceptable. Penetrating the cavity of the larger freshwater shells, the horse-leech takes up a permanent dwelling there, until emptying them of their contents, should it be able. Several of this and the preceding species, the *octoculata*, having been collected from the same place, one of the latter, half-swallowed by a horse-leech scarcely double its size, was discovered struggling for liberty. But its ferocious enemy,

adhering firmly by the sucker, and undulating its body in the water, as if to aid deglutition, occupied three hours in finishing its task, when it appeared much distended by so copious a repast. Another attempted to devour a dead leech of a different kind, absorbing the smaller extremity here, as the former did with its living companion; but the latter proved too large for its gullet. Considering the strength of the prey, indeed, and the adhesion, it appears a hardy effort of leeches to devour each other, unless under great disparity of size."—*Dalyell.*

HÆMOPSIS (page 47).

Intestine sacculated, the anterior cæca small, the hindmost pair highly developed.

Hæmopsis sanguisuga (page 47).

It is a vulgar belief that nine horse-leeches will suck a horse to death,—a belief which seems to prevail over Northern Europe, &c.

Leeches seem to be very plentiful in some parts of Ireland. The Rev. James Hall, in his "Tour through Ireland," vol. i. p. 196 (1813), remarks of the Lake of Blarney, that it was so full of leeches "that if any person put in his foot, or his arm, it will soon be black with them," &c. This, I suppose, is what the natives of Donegal call "Loch leech."

HIRUDO (page 48).

"Je me suis assuré que chacun des denticles qui hérissent les mâchoires des sangsues est une petite dent sécrétée par sa capsule spéciale."—*Quatrefages, Ann. des Sc. nat.* viii. 36 (1847).

Intestine sacculated with highly developed cæca.

Hirudo medicinalis (page 48).

The medicinal leech has much engaged the attention of naturalists. Blainville has given an excellent summary of their researches, corrected and extended by his personal observation, and to his essay we would refer the student who wishes to know the structure and physiology of this animal.—*Dict. des Sc. nat.* xlvii. 208–239.

The medicinal leech lives in still and stagnant waters. It appears to have been common, until the present century, in this country, where it is now rare*. I have never seen it in our district, but I have heard old people say that they could remember when it was plentiful, and when a few infirm women and children, unfit for field work, earned some gains by gathering them. This was done either

* "Lacus et stagna Scotica hirudinibus olim superfluebant: nuperis autem annis pene destituta sunt; idque e pluribus causis," &c.—*Watson.* Sir J. G. Dalyell enumerates several habitats in Scotland where they are still to be found.

by wading bare-legged into the water, or by hand-picking. To distinguish it from the horse-leech it was called the Lough leech*.

There is an old woman (Mrs. Darling, midwife) still living in the village of Chirnside, who in former years—from 1808 till about 1825—used regularly to collect the medical leech in a small lakelet at Whitehall in this parish. That piece of water was drained away about thirty years since. Boys say, that should the horse-leech fix upon any part of the body, it will not lose its hold till it suck the person to death: a few years ago a woman from Reston brought me about a score of large horse-leeches in a bottle; she had collected them in a ditch near that village, and supposed them to be the genuine "medical leeches."

The leech sucks the blood willingly of all vertebrated animals that come within its reach. To enable it to do this the body is first firmly attached to the victim by the anal sucker, and the mouth then applied to a spot selected for its evenness, or for being free of hair in quadrupeds. Frogs, asks, and fish are, however, a more common prey. The skin is cut through by the three serrated jaws which arm the mouth, applied firmly; and hence the wound is triangular, or rather triradiate, the little incisions converging to a centre†. Suction by the cupped mouth draws forth the blood readily; and the animal will not voluntarily leave its hold until it has gorged itself, and the body has become distended to more than twice its previous size. It then drops off satiated, and prepared for a long fast; how long, has not certainly been ascertained. Leeches have been kept for several months—nay for years—in vessels containing water only, and they do not seem to suffer from the want of food. They lie in the vessels sometimes submerged, and often an inch or two above the surface; and sometimes they are seen to move about restlessly, and swim through the water in the manner of eels. These positions and motions it has been long the fashion to ascribe to atmospherical changes; and hence it has been proposed that leeches should be kept in glass vases and substituted for our barometers. Cowper declares that leeches, "in point of the earliest intelligence, are worth all the barometers in the world;" and the eccentric Dr. J. Forster informs us that "Leeches confined in a glass of water, by their motions foretell rain and wind, before which they seem much agitated, particularly before thunder and lightning."—*Pock.*

* ..... "which wavered about, for all the world like a gigantic *Loch-leech*, held by the tail between the finger and thumb, while it was poking its vast snout about in the clouds in search of a spot to fasten on."—*Tom Cringle's Log*, ch. 2.

† "Si la sangsue veut y sucer le sang, elle avance toute la masse buccale, en évase les lèvres intérieures, érige et redresse les trois tubercules dentifères qui portent les crochets, en les endurcissant par une forte contraction de tout leur tissu musculaire. Par les alternatives ou légères intermittences de cette contraction des trois tubercules, ce qui produit la douleur quelquefois assez vive de la morsure des sangsues, il résulte une action combinée de pression et de frottement du bord garni de crochets, à la manière d'une roue dentée, et par suite une petite plaie qui, traversant l'épiderme, arrive jusqu'au réseau vasculaire et peut-être au-delà, d'où la sortie du sang par la rupture des petits vaisseaux."—*Blainville.* See also Jones's Anim. Kingd. p. 192-3, where the general reader will find a popular account of the anatomy of the leech.

Encyclop. Nat. Phen. p. 37*.—Observations which I made many years ago rather confirm the opinion of Dr. J. Rawlins Johnson, that the movements of the leeches are not to be relied upon as indications of any weather: viz. no given motion of theirs is connected necessarily with any given change which the day is about to suffer†.

The generation of leeches was, until recently (1822), involved in obscurity and doubt. There was much discussion as to whether they were oviparous or viviparous, and observations in support of each view were published, without settling the question, although certainly the evidence was rather most favourable to those who asserted that the young were brought forth alive. The subject is now well understood. In due season the parturient leech produces its ova with a glairy fluid in which they are evolved. This becomes the nucleus of a cocoon of a sponge-like fibrous texture, and which bears "no unapt resemblance to the cocoon of the silk-worm." It is, however, less in size, of an oval shape, about the size of a filbert, and so light and spongy that it may easily be mistaken for a small sponge. The inner wall of the cocoon is more compact than the external surface; and the cocoon, as already mentioned, is filled with the glairy fluid, containing from about six to twenty ova. It is buried by the leech in the mud or clay of its pond; and there the ova are matured and the young born. These escape from their cocoon by a small aperture at one pole; for, at this period, there is a hole at one or other extremity of the cocoon, or both extremities, prepared for their exit by a prescience which foresaw the need.

The young, when hatched, are little thicker than packthread, and they grow so slowly that they do not acquire the adult size until they are three years old. They are then fit to be used in medicine. It is said, however, that they do not become fruitful till they are six or seven years old.

Leeches are extensively used in medicine, and have been so from an early period—so much so, that the doctor is often styled a leech by authors who wrote about Queen Elizabeth's time‡, and since,—no doubt the synonym being intended to indicate their healing power, and not any wish on the doctor's part to draw the golden fee—the heart's-blood only of the usurious. Ancient authors treat also copiously of the accidents and dangers that flow from the swallowing of leeches, and from their getting into the mouth and throat; and

* "On dit cependant, que dans certaines parties de la France, et entre autres aux environs de Bourbonne-les-bains, les habitans de la campagne n'ont pas d'autres baromètres qu'une caraffe d'eau, contenant quelques sangsues avec un peu de terre au fond, et même une échelle en bois graduée, pour juger par le degré d'élévation ou d'abaissement des sangsues, celui du beau ou du mauvais temps."—*Blainville*, who, however, is sceptical on the point, and questions the fact. Garner says it is the horse-leech which, "kept in a bottle, forms so good a barometer, foretelling bad weather by its restlessness."—*Stafford*, p. 331. See Moq.-Tand. p. 213.

† Watson also denies their barometrical virtue.—*Disp.* p. 14.

‡ "Wise Leeches will not vain receipts obtrude,
While growing pains pronounce the humours crude;
Deaf to complaints, they wait upon the ill
Till some soft crisis authorize their skill."—*Dryden.*

give us many directions in what manner to prevent the consequences. One is very ingenious :—the patient is ordered to get into a hot bath and hold cold water in his mouth, which will have the effect of attracting the leech towards it!—See Adam's *Paul. Æginet.* ii. 208. They were prescribed by Q. Seremis Samonicus internally to prevent the growth of hairs ; and here is the receipt :—

C. xxxv. To prevent the growth of hairs :—

> . . . . E stagnis cessantibus exos hirudo
> Sumitur, et vivens Samiâ torretur in ollâ :
> Hæc acidis jungit permixta liquoribus artus
> Avulsamque vetat rursus percrescere silvam.

In the poetry of the Servians the leech is the favourite object of comparison with the eyebrows of beauty :—" Like it are the maiden's eyebrows :"—

> " For eyebrows, from the ocean's wave
> They took two leeches."—*Hone's Every Day Book*, iii. 535.

Diesing states, on the authority of Dr. J. R. Johnson, that *Hirudo troctina* is a native of England (*Syst. Helm.* i. 468).

GLOSSIPHONIA (page 50).

These leeches are usually so transparent when alive as to permit the disposition of the viscera to be seen without any dissection. They are further distinguished,—1st, by having a cylindrical proboscis which they extrude from the mouth when they are about to suck their prey ; 2ndly, by being more strictly geometrical in their mode of progression than other leeches, and capable of contracting the body into a ball when alarmed almost as completely as the wood-louse ; 3rdly, by carrying the young for a considerable time after birth attached beneath the belly. The ova are not enclosed in a capsule. Their development has been carefully described by Grube. Müller has made some interesting observations on the habits of the species.—*Hirud. Berol.* 33 *et seq.*

Glossiphonia tessellata (page 50).

Leech soft and gelatinous, semitransparent, of a light brown, olive or grey colour, blotched with green and yellow, speckled with black dots, and rough with minute sharp granules, somewhat convex on the dorsal, and flat on the ventral surface, oblong or pear-shaped when at rest, linear-oblong and clavate when extended, and then about 2 inches in length. From the transparency of the body the interranea are visible, and they form a series of curved, short, dark fasciæ on each side of the mesial line by which they are connected. There are more than ten of these crucial markings, which begin, with a few faintly marked ones, a short distance behind the neck, and are continued to the sucker. The hinder pairs are connected

together by lateral anastomoses; and there is an oblong space marked out by a red vessel. Anterior end narrow, slightly dilated at the apex into a spoon-shaped sucker; the aperture terminal. Eyes eight, in four pairs in a linear series down the neck, the first pair smaller and approximated; each eye or pair surrounded by a pale halo. Anal sucker proportionably small, circular. Sides crenulate.

This beautiful leech varies considerably in colour and in the degree of its transparency. The crucial markings are sometimes faintly marked or obsolete, but the oblong system of blood-vessels over the sucker becomes then more obvious. The body is usually marked very prettily with four rows of white circular dots down the back, equally distanced; and the granules of the rings are so arranged that they also form a regular series of longitudinal rows. It seems naturally a sluggish species, and likes to congregate in clusters, which have a disagreeable appearance from the gelatinous consistence of the worms. It moves by attaching the oral end, and trailing the body onwards, without raising it from the surface of the ground. It likes to remain stationary, waving the body by a series of wide undulations; but it cannot swim. When fully contracted, the body is almost round, with a short apiculus formed by the projecting snout. It does not willingly leave the water.

Holy Island Lough, plentiful. Coldingham Lough, *Sir J. G. Dalyell*, who says that it is "rarely disseminated in Scotland." He also tells us that it is frequently in motion, and one specimen "could not be said ever to rest." The nature of its food is somewhat uncertain*. The ova are produced after the manner of its genus.

"The figure of the Chequered Leech, at rest, is the longitudinal half of a pear, between five and six lines in length, by about the same in width across the longest diameter; when extended, it stretches about two inches and a quarter, when the width at the base is three lines, and the diameter of the sucker one line. The anterior extremity, when extended, is somewhat of a long lanceolate form, with four pairs of black eyes down the middle, very distinct, the outer pair rather smaller than the others. The body is environed by a broad, thin, crenate, not chequered margin, with a row of yellow tubercles.

"The body is divided into segments somewhat broad, and divided by narrow circles. Its substance is wholly gelatinous—quivering with the slightest motion.

"This is infinitely the finest and most beautiful of the Scottish leeches, generally of a fine translucent green, speckled black and yellow. Sometimes there appear several longitudinal rows of yellow specks interspersed with black specks; sometimes all are disposed with less regularity."

"The colour undergoes considerable variation. It fades as the

* Mueller believes that it sucks the blood of fishes and of frogs. It did not attack the mollusca which were given to it. It hatches, as it were, the eggs, which are of a deep yellow colour.—*Aspectum*, &c., p. 22.

water becomes stale, and revives of a deeper green when renewed. The belly is leaden-grey, minutely speckled.

"The viscera of this leech are more numerous, and of different formation from those of any others. When replete, they are alike conspicuous, and probably less so, according as they are more or less empty. They seem constructed after the same general plan, however, as the viscera of the *complanata* and *stagnalis*. In a small specimen replete with food, they seemed to consist of eighteen pairs diverging from right and left of the main trunk or stomach."—(p. 40.)

Moves like *Glossopora*, and, like it, carries the young under the abdomen. "Early in July I observed at least 150 young adhering to the belly of a specimen, which appeared very careful of them,—folding its body longitudinally as if for their protection, while it crawled along. The brood attached to another still remained late in September."—(p. 41.)

"I have found this animal in Coldingham Lough in Berwickshire, and in the counties of Edinburgh and Linlithgow. I was indebted to Sir Walter Trevelyan, Bart., for several specimens from the Island of Bute. Nevertheless the species is rare, and it seems to have disappeared entirely from some places where it dwelt a number of years ago."—*Dalyell.*

Glossiphonia verrucata (page 51).

Body, when contracted, elliptical (being narrowed and obtuse at both ends and bulged about the middle), convex on the back, flat on the ventral surface, of a uniform cream-yellow colour, distinctly annular, the rings equal, very narrow and numerous, raised and granulous; the granules in a single series and most easily seen on the ventral half; the sides thickened and crenulate. Eyes six, distinct, in three pairs thus ⁚ ⁚ , the anterior apparently coalescent. Oral sucker continuous with the body, concave, the upper lip projecting forwards a little: anal sucker larger, circular, entire, unarmed, with a plain thickish rim. Sexual pores distinct, more especially the anterior.

This description is made from a specimen preserved in spirits, which was about 10 lines in length. The granules on the rings do not form longitudinal series, but some on the back appear a very little larger than the others, and whitish,—probably from being elevated above the surface. It could not be ascertained between what rings the generative pores were placed, for they are too narrow and too closely compacted to be counted with accuracy.

Body obpyriform, elongate-elliptical or linear-elongate, of a greyish translucent colour, speckled, with two parallel interrupted granulous lines on the back on each side of the mesial line. Head obtusely cuneiform. Eyes six, in three pairs, black and distinct. Rings equal, crenulate on the margins. Back convex; the ventral surface flat or somewhat concave. Sucker ventral, circular.

In many specimens the interranea are very obvious from the pellucidity of the body. They form a pinnated leaf down the back, the lateral cæca, which are six in number, curving neatly and regularly backwards, and the two posterior continued backwards in a straight line.

In *G. marginata* there is a single egg in each capsule.

Mueller says that, when at rest, this leech is about equal in breadth at both ends, which the specimens in spirits would seem to confirm. The colour of the back, when in life, is greenish, with many brown lines; but, in spirits, it is ochre-yellow, with pale brown lines, on which the whitish prominent tubercles are placed. These are in six rows, nearly equidistant, one on each side of the mesial line, two lateral rows of lesser granules, and two almost marginal. The margin is neatly crenulate or regularly waved. The ventral surface is paler than the dorsal, and unicolorous in spirits. The head is continuous with the body, and it is very difficult to detect any appearance of eyes.

From *G. complanata* it differs in its greater size, and in being less narrowed in front; in colour; in the number and form of the dorsal granules; and in the proportion of the intestinal appendages. It is also more active.

Glossiphonia sexoculata (page 51).

"The natural abode of this species is in lakes or ponds, on the under surface of stones, on decaying wood, or in the recesses formed by the folds of the Iris and other aquatic plants."—*Dalyell.*

This species does not leave the water, but it will often raise its anterior part beyond the surface, and remain thus for several days. Even when entirely submerged, I have known it remain stationary for a long time. Hunger does not stimulate it to move but at long intervals. Müller says that it can live a quarter of a year at least without food having been ever perceptible in the intestine. It "feeds abundantly on both animal and vegetable substances;" it preys especially on shelled mollusca, and is a cruel foe, against which the snail can find no defence, either in its shell, or in its tenacity of life. When alarmed, the leech coils itself up into a ball—the hedgehog of the pond, and protects the head by the broader posterior end.

G. sexoculata is oviparous. "The chief season of breeding is March and April, and it continues throughout summer. Many are very prolific." There are from six to twelve ova extruded at a time, not in a capsule, but "held together by some gelatinous matter*;" and about fifty ova in all are produced at a birth. These are received into the abdominal pouch of the parent, where they remain until they are hatched, which is in about twelve or fourteen days. The young continue attached to this marsupium for some time, fixed by the anal sucker, and waving the body at will; but they frequently

* But Grube says that there are from five to seven ova enveloped in a very transparent soft saccular egg-case.—*Rep. Ray Soc. Zool.* 1847, p. 513.

leave the pouch, and return again to their shelter. This singular fact appears to have been first noticed by Henry Baker.

Glossiphonia heteroclita (page 52).

Blainville says that this is undoubtedly a variety of *G. sexoculata*, or rather younger individuals,—an opinion which Brightwell's figure seems to confirm. Moquin-Tandon says that it is less than *G. sexoculata*, less crustaceous, more extensile and transparent, and not so inactive,—all qualities in agreement with Blainville's view; and when he tells us that the eyes, excepting the front ones, are set wider asunder, he lets us know that this is apparently so; and it is surely a character of no importance, were it a fact.

Glossiphonia bioculata (page 52).

Hab. Lakes, ponds, and ditches, "and in places with but little water, lurking under stones, and especially beneath the bark of decaying trees and branches, where its abode is permanent."—*Dalyell.*

This is a smaller and rather more active species than *G. sexoculata*. Sir J. G. Dalyell says, "it feeds on the vegetable matter among which it dwells, and it likewise consumes fish." There is no doubt that, when unconfined, it preys on living animals, sucking their juices; and Sir J. G. Dalyell indeed ascertained that the vermilion-coloured larva of a dipterous fly was the favourite victim. "When the prey was introduced to vessels containing the leeches, they raised themselves on the sucker, as if surveying around; then some one bolder than the rest advanced, endeavouring to affix itself to the victim, which being effected, the position was pertinaciously maintained in spite of its writhing and struggles. Should such an attack occur at night, an empty, brown, transparent skin, scarcely visible, is all that remains of the prey in the morning, while the intestines of its enemies are seen replete with the red substance that constituted the body. It is singular how the fleshy matter of the prey is extracted, while the integument is left quite entire."

The pulmonated mollusca are not less acceptable to this leech. Müller gives us an account of what he witnessed (*Müller's Verm.* ii. 41).

I have not seen a specimen that exceeded an inch in length, and it is narrow proportionally when extended. It is of a grey colour, speckled, with a fascia along the back paler than the rest of the body, and which loses itself before it reaches the tail. The body enlarges from the head backwards, and is bulged behind, subcylindrical, distinctly ringed, and hence the sides are neatly crenulated. Although almost semitransparent, no interranea are visible, unless when the leech has been recently gorged with food. There is a series of small sharp granules on each ring. Head colourless, with

two black almost coalescent eyes; and behind them is a brownish spot marking the extremity of the retracted proboscis. Sucker ventral.

Glossiphonia flava (page 53).

"The length of the specimens of this species, when quiescent, was from six to more lines; when extended, about fourteen lines. General form not unlike the medicinal leech. Form of the head lanceolate or trout-shaped. Eyes two, black, in front. The viscera consist of thirteen pairs of transverse sacs, sufficiently conspicuous in some specimens. The body is composed of numerous segments slightly indented. The predominant colour is yellow, sometimes very vivid, sometimes dusky; and there are specimens whose contrasting hues expose four longitudinal rows of beautiful yellow spots, running down the whole back to the sucker, which itself has a marginal circular row. Under the microscope, these, so ornamental to the eye, prove to be only irregular transverse short marks.

"Though the general form of the animal, while quiescent, corresponds with that of the *medicinalis*, it is not so thick, plump, and heavy as the *tessellata*, nor alike tremulous. Also some of the young at an early stage appear quite cylindrical.

"Much of the beauty of this animal depends on the colour. Besides the four rows of yellow spots down the whole back, there is a marginal row on each side, which can be seen from below." Breeds chiefly from May until August, and presents no specific peculiarity in this respect.

Glossiphonia vitrina (page 53).

Brightwell and Dalyell found each a single specimen only. "Our specimen," says Mr. Brightwell, "is nearly cylindrical, about an inch long, the posterior disk larger than the anterior; eight eyes, in two rows of four each; colour green, with two indistinct, whitish, longitudinal series of spots above, and two spots underneath; the whole body, magnified, appears studded with small, dark, irregular specks." The abdomen was covered with young, "which adhered solely by the posterior disk. We kept this specimen from the 24th of June to the 28th of August, when it died. The young remained attached to the parent during all this time, and we took some pains to ascertain their exact number, and found they amounted to 143. We never saw the parent or the young ones take any food. The young differed altogether in colour from the parent, the latter being a deep green, the former a light ash-colour. The eyes of the parent could scarcely be discerned with a lens; the eyes of the young were very conspicuous, and could be seen with the naked eye. The motion of this species is geometrical, and it never swims. The abdomen of the parent had no pouch, but was much expanded by the adhesion of so numerous a progeny; so much so, as to make the form appear very different to the young."

Sir J. G. Dalyell describes his specimen as being about 2 inches in length, tapering slightly from near the sucker, where it is between 2 and 3 lines in breadth. Head lanceolate, with four pair of black eyes, placed medianally. Segments numerous and narrow. "The colour is universally dark green, and its appearance much of the character exposed on the fracture of a common dark green bottle. The surface is faintly speckled under the microscope, and the belly somewhat paler." (p. 43.)

Fam. I. **LUMBRICIDÆ** (page 57).

The earthworm is the representative of this order, and it has been studied with greater care, by anatomists and naturalists, than any other annelid, the leech only excepted. Morren has devoted a quarto volume to its anatomy*; and the complexness of structure, which he has demonstrated the worm to possess, might be Agassiz's best plea for placing it at the head of its class. But there are species of earthworms, and which, until recently, were considered to be congenerical, and are still considered to be members of the same family. There are earthworms, so simple in structure, that few or no annelids are more so. Thus it is in almost every order we are pleased to designate as natural. A very few general characters circumscribe the group; but, within the circle, the individual members present such a diversity in the details of their organization, and of their habits, that the study of each becomes necessary, if we would avoid vague and erroneous generalizations.

Generative organs united in one mass. Young like the parent on birth from the egg. No special organs of respiration.

There is, perhaps, no phœnomenon more general in the class than the reproduction of organs and portions of the body, which may have been torn away by design or accident. Species in every family have been ascertained to have this remarkable power to a greater or less degree; but it was in species of the present order that the fact was first experimentally ascertained, and before the physiologist could contemplate it without seeing in the renovation something akin to a miracle.

Trembley having communicated to M. Charles Bonnet of Geneva the result of his experiments on the Hydra or Polype, the latter was instigated to try similar experiments on some small worms which he found living in the fresh waters of his neighbourhood. He cut his

* De Lumbrici terrestris historia naturali necnon anatomia tractatus. Auctore Carolo-F.-A. Morren. Accedunt tabulæ æri incisæ xxxii. Bruxellis. 1829. In reference to this work, see Edin. Journ. Nat. & Geogr. Science, iii. 375, and Loud. Mag. Nat. Hist. ix. 240. Cuvier has given a lucid view of Dugès' anatomy of the family in his "Analyse des travaux de l'Académie Royale des Sciences pendant l'année 1828," pp. 80–82 & 84.

The nervous system is shortly sketched by M. A. de Quatrefages in Ann. des Sc. nat. viii. 36 (1847).

worms into halves,—into three, four, and, ultimately, into as many as fourteen pieces; and as the entire animal did not much exceed an inch in length, the portions must, in many of the experiments, have been necessarily very small. The halves became whole worms,—the thirds and quarters also,—and the morsels grew to be complete individuals, not to be distinguishable from the original stock. Occasionally, when the divisions were carried to a high number, as to fourteen, some of the sections perished, but there was no one in particular more subject to this misfortune than another. The head produced a body and tail; the posterior half a head with all its organs; and of the intermediate portions it was observed, as a uniform law, that the head always pullulated from the front section, and the tail always from the hinder*. And it was also noticed, that after a section, the front of a hinder portion became immediately endowed with the office and functions of a head,—viz. it was pushed forwards in progression, it examined the way, and it was used to burrow in the soft soil. The redintegration began within a few hours after the amputation was made in warm weather, but, in colder weather, several days might elapse; and the completion of the process was a good deal dependent on the temperature. The new parts could readily be distinguished for some time from the old by their paler colour and lesser diameter; but ultimately they became like to the original, and were endowed with the same vital powers. These new portions, if they were cut away, were reproduced again and again,—as often at least as the patience of the experimenter could induce him to carry on his observations. With the worms that are more strictly terrestrial, experiments of this kind were found not to be so uniformly successful. The renewal of the amputated parts was comparatively slow; and very often the worm, and the severed pieces, died under the injuries and treatment inflicted upon them†.

These experiments of Bonnet were successfully repeated by M. Lyonet in 1741, on a kind of aquatic worm about $3\frac{1}{2}$ inches in length, and as thick as the string of a violin. From its size, he was enabled to cut the worm into not less than thirty or forty fragments; and yet each lived, and became, in due season, like unto the parent. Father Mazolleni of Rome, having these facts communicated to him by M. de Reaumur, hastened to confirm them by his own experience, although he seems not to have carried the sections of the body to the number which Lyonet had done.

From the experiments he had himself made, and from those of his friends just mentioned, Reaumur concluded that if there were any species of these aquatic worms which did not possess the property of reproducing amputated parts, they were exceptions to the rule of life by which the growth of these animals was governed. He

* "The middle part of an earthworm, deprived of both ends, expeditiously moved away when touched."—*Spallanzani's Tracts*, i. p. xlvi. See Williams, Rep. 1851, p. 250.

† Traité d'Insectologie; ou, Observations sur quelques espèces de Vers d'eau douce, qui, coupés par morceaux, deviennent autant d'Animaux complets. Par M. Charles Bonnet. 2de partie. Paris, 1745. 12mo.

was pleased with the success he had in experimenting on the *Nais* or *Stylaria* of Lamarck, of which he saw the half become a perfect animal in ten or twelve days, notwithstanding the great number of external organs and the number of feet which were to be remade; and notwithstanding that the singular dart or proboscis, which projects in front of the head, had to be recreated with all its original delicacy, and made to shoot out from a segment which, originally, had its position in the centre of the body*.

As Bonnet had done, so did Reaumur experiment also on earthworms. He cut individuals into two unequal halves, the anterior being made considerably shorter than the posterior. The worm seemed to suffer little from the division. Often in less than two days, the anterior portion had become a perfect animal, so far at least as the possession of a structure alike to the original was concerned, for it is true that the new tail has then by no means acquired the size nor length of the old one; but, by slow degrees, ring after ring continued to be developed, and, after the lapse of several months, the new had become the equal of the part which had been lopped away. The reproduction of the anterior portion from the posterior was effected with comparative slowness, for three or four months were required for the task; and, in many instances, the experiment was unsuccessful, especially in the common species, two others allied to it being more gifted with the power of regermination. But neither the slowness of the growth, nor the precariousness of the experiment, does in any way lessen the miracle. In the latter case, especially, there is not merely a production of rings very similar to each other —ring evolving ring,—but there is the making anew of a head with its nerves of sense, and with all the curious mechanism of a mouth; —there is the regrowth of organs, male and female, on the same individual, and of no ordinary complication;—and there are new organs wherewith the animal has to digest and breathe, &c. No wonder that physiologists were startled at such phænomena, and were induced to indulge in speculations of a curious kind as to the divisibility of the living principle, and the connexion between material organization and spiritual essence.

Spallanzani, the friend of M. Bonnet, and the most celebrated experimentalist of his age, pursued the inquiry, and extended its scope. So far as the worms were concerned, he confirmed the facts announced by his friend as to the power of reproduction in severed parts; but one conclusion arrived at was at variance with an axiom of Bonnet's. "If the two ends are cut off a worm," says Mr. Dalyell, epitomizing Spallanzani's experiments, "the middle piece will become a perfect animal; but the head will not germinate from what we should suppose the natural place, that is, the anterior part; on the contrary, it proceeds from the portion that was next the original

* Reaumur says that he did not succeed in making the Nereides, from 7 to 8 inches long, reproduce their amputated organs; "mais les essais n'ont peut-être pas été encore assez répétés ni assez suivis."—*Pref.* lix. See Williams, Rep. 1851, p. 249.

tail; and the new tail will grow from the anterior part of the trunk*."

This short review of the evidence is sufficient to show that physiologists were not too credulous when they received the facts into their creed; nor did any future experiments cast doubt over them, although the conclusions drawn were occasionally modified to conform to the results of different observers, arising, probably, from a difference in the species operated upon. Hence Professor Owen properly introduced the facts into his "Lectures," without any expression of disbelief†—a proceeding which drew down the following anathema:—"On the authority of hundreds of observations laboriously repeated at every season of the year, the author of this Report (Dr. Thomas Williams) can declare with deliberate firmness, that there is not one word of truth in the above statement. It is because accounts so fabulous have been rendered 'respectable' by the fact that Professor Owen has thrown over them the ægis of his great authority, that they demand a contradiction which may displease by the strength of the language in which it is given‡." Displease! It is, with all due deference, the language of a froward tongue, and unlike that with which a prudent man dealeth with knowledge. If the negative experiments of one individual were to invalidate and remove the facts established by many positive experiments, there could be no advances made in science; and it is very singular that Dr. Williams never found a worm that had evidently had a portion of its body renewed—the original portion having been lost by some accident. Specimens of this kind are not rare§. Morren has figured such a one in his work (tab. i. fig. 3), where all the portion posterior to the clitellus has been reproduced. And Dr. Williams's denial has called forth additional corroboration of the fact. At a meeting of the Linnean Society, November 1, 1853, Mr. Newport "exhibited three specimens of earthworms, which have had parts of their bodies reproduced." "One of the specimens exhibited was still living, the others were preserved in spirit. In each of them more than one-third of the posterior division of the body had been restored. The new parts in all were much smaller in diameter, and the segments much shorter than in the original anterior portion of the body‖."

In reference to the power which the *Lumbrici* have of reproducing amputated portions of the body, M. Ant. Dugès says:—Valmont de

* Tracts on the Natural History of Animals and Vegetables, translated from the original of the Abbé Spallanzani, by John G. Dalyell.—Vol. i. p. lxix.

† Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals, p. 143. Lond. 1843.

‡ Report on the British Annelida, p. 247, in the Rep. Brit. Assoc. for 1851.

§ "It is no uncommon thing, at this season of the year (autumn?), to find earthworms which have had a large portion of the body restored, as is easily seen by the much lighter colour, more delicate texture, and smaller dimensions of the new parts, as compared with the original parts of the animal."—*Newport in Ann. & Mag. Nat. Hist.* ser. 2. xiii. p. 423.

‖ Ann. & Mag. Nat. Hist. *loc. cit.* Professor Jones says, "Careful experiments, &c." p. 211. See also Loudon's Gard. Magazine, xvii. p. 215 (1841).

Bomare and M. Bosc have unsuccessfully repeated the experiments of Reaumur and Bonnet, both on the Earthworms and on the Naides. Reaumur, the only one who says that he had seen the head reproduced, makes merely a simple assertion of the fact; and Bonnet reduces this almost to nothing, impliedly and directly, when he informs us that all the worms died before the reproduction of the front part was completed. He was more fortunate with the Naides. For a long time Dugès believed the assertion of Reaumur to be without any proof. In his experiments, a worm, when cut into two portions, remade readily an anus in the anterior portion, for the healing of the wound sufficed for this; but the posterior portion, although preserved alive for four or five months, showed no appearances of any new growth in front. It died at length from inanition, remaining on the surface of the moist earth, in which it had buried only its hinder extremity. We can easily imagine how difficult it must be for the nutritive function to reproduce a part in which are seated not only a ganglion peculiar in its position, but a mouth also, stomach, moniliform vessels, and organs of generation. In the posterior part, on the contrary, reproduction has nothing in it unnatural. The growth which goes on before maturity adds to the body ring after ring in succession, each acquiring its new ganglion, as we can easily observe in the Naides and in the Myriapods:—and so are lost parts replaced.

These reflections induced Dugès to simplify the experiment. Thus, considering that the organs are situated in the most inflated part of the Lumbricus, he cut away only the first four or eight rings, satisfying himself that a part of the œsophagus and of the nervous system, the cephalic ganglion at least, had been removed in the section. At the end of ten days (it was in the month of June, when the thermometer was about 18° Reaum.), if only four rings had been cut off, and after two or three times as many, if seven or eight rings had been removed, Dugès observed a conical reddish obtuse mamilla project in front. In eight or ten days more this growth had become more pointed, very contractile, red and moist, and the extirpated rings could be perfectly recognized,—the anterior lip and the mouth, still very small, but of the normal shape. Then the worm began to burrow in the earth, and crawled with the head foremost; and then the intestine began to be filled with the earth which the *Lumbrici* swallow for food. Gradually this new portion acquired the size of that which it replaced. These experiments made on *Lumbricus trapezoides*, probably identical with our *L. terrestris*, leave no doubt that a limited portion of the front can be reproduced: but it still remains doubtful whether, when a worm is cut in two halves, each half will ever become a perfect worm; for Dugès found that when the section was considerable, the part soon died.

Dugès does not doubt the correctness of the conclusions drawn from the experiments of Bonnet and Müller on the *Naides*.—*Ann. des Sc. nat.* xv. pp. 316–319.

Bearing on the question, it may be mentioned that the *Eunice sanguinea*, which has a highly developed cerebral organization, can

reproduce the accidentally amputated head.—*Quatrefages in Ann. des Sc. nat.* ii. p. 100 (1844).

The Earthworm moves along the surface, or in the soil, by alternate elongations and contractions of a determinate portion of the body. Stretching forward the anterior extremity to the utmost, it is then fixed against the ground by means of the lateral bristles, and now the rest of the body is drawn to the fixed point. It can move backwards or forwards with nearly equal facility; and when seized in its progress, it wriggles and twists itself into many coiled knots and circles. This it does also when wounded; and its writhings surely indicate a severe degree of suffering in the poor worm, which is too often wantonly trodden upon. The movements of the Earthworm in its burrow are performed with much greater rapidity than on the surface, a superiority which results from the disposition of the bristles along the sides; for in a circular tube alone can they all be brought into action and made to act as fulcra, the animal having the power of protruding them to a slight extent. Hence we find that the hole of the worm is of the same figure as its body, and nearly of the same calibre, that the ascent and descent may be retarded neither by over-straightness, nor by a wideness which would render the contact of the bristles against its walls impossible. The holes are in general sinuous, and worked in an oblique direction, and lined with the slimy juice which exudes from the skin. They vary in depth from a few inches to upwards of 4 feet, and have two or, occasionally, several apertures, of which one is the vent, whence they eject those vermicular pellets of earth that have passed through the intestine, and are in fact moulded and fashioned within it.

The mode in which the Earthworm burrows is this:—The anterior extremity of the worm forms a cone, gradually tapering from a little in front of the belt to the snout, which is formed by the upper lip being somewhat elongated over the mouth, like a short proboscis. As this can be shortened and thickened or made gracile and sharp at will, we can understand its fitness as an auger, and its equal aptness for making a hole rather larger than the body when relaxed and undistended. Wishing to burrow, and having selected a soft moist earth, the worm stretches forward this anterior portion of its body and stiffens it. It now pouts out the upper lip, and rendering it, too, tense and elastic, the worm pushes it under the soil or clod, raises it, and casts it aside; then again it digs and loosens another portion of earth, until, by many repetitions and much patience, the tunnel is insensibly yet speedily completed. As the worm swallows the great proportion of the soil raised in the progress of the work, nature has furnished it with no instruments for the removal of the obstacle, such as have been given to many other boring insects.

LUMBRICUS* (page 57).

Besides the sexual pores, which in the *L. terrestris* are in the

* "*Lumbrici* Latinis a lubricitate dicti videntur."—*Raius.* Professor Dugès of

sixteenth or seventeenth ring, there are two similar but smaller pores on the twenty-seventh or twenty-eighth ring; and there is a series of very minute pores along the back, one pore to every ring excepting the anterior ones, which are unprovided with it. They are most easily seen near the middle of the body, and especially on that part of it which is between the sixteenth ring and the clitellus. In a large specimen the series consists altogether of from 110 to 120 pores, and they are believed to be the entrances to oblong vesicles arranged in a series along the sides, and in which the blood of the worm is aërated. Some good naturalists affirm, however, that the vesicles are merely mucous cysts for furnishing the slimy fluid which lubricates the surface; and Morren, while he maintains their pulmonary character and use, is also inclined to admit that they may be at the same time mucigerous, and the pores ducts for the outflow of the secretion.

The Earthworm is hermaphrodite, but the copulation of two individuals is required to impregnate the eggs.

On the structure of the genus see Dugès' essay in the *Ann. des Sc. nat.* xv. p. 298, &c.

Mr. Macdonald is confident that the earthworm is the Skolex of Homer.—*Zoology of Homer*, p. 15. But it has yet to be ascertained whether the common species of Greece is identical with the British species.

Lumbricus terrestris (page 58).

A large species, attaining the length of 8 or even of 10 inches. The portion anterior to the clitellus is cylindrical, forming a very elongated cone, of a dark-brown or bluish-purple colour, paler beneath; the posterior portion somewhat flattened, more especially near the end, which is spathulate and crenulate on the sides. The colour of this portion is a sort of yellowish-brown; and the skin is sufficiently transparent to permit the course of the red vessel that runs down the back, in the medial line, to be seen, as well as the dusky interranea. Head an elongated obtuse cone. On the ring

Montpellier distinguishes thirty-five species of this genus. He divides it into two sections; the first distinguished by having the bristles in pairs, the second by having them placed in the ring at equal distances. Then the number of the ring in which the vulva is perforated serves to divide the sections each into two subsections, for the vulva may be either on the sixteenth or on the fourteenth ring. Next, the number of rings in the clitellus serves to bring the species into lesser groups, and the species thus limited are distinguished separately by the number of rings between the first ring or head and the last in the clitellus. On paper this seems an exact and easy method for ascertaining any of the species, but in practice it will be found useless. It is not always easy to count the rings; nay, generally those of the clitellus cannot be counted; and there is often a lesser or half ring which may or may not be enumerated, as the whim dictates. We cannot even always certainly fix upon the exact ring in which the vulva is situated. At the season when the organs connected with it are developed, the pore is sometimes so turgid that it presses on the adjacent rings and obscures their lines of separation. Usually the orifice is undistinguishable. As for the number of rings between the head and clitellus, we know that it is uncertain and variable in individuals of the same species.

behind are two impressed lines or furrows, either separate or connected by a cross bar so as to resemble the letter H. Clitellus smooth, glistening, yellowish-brown, of six equal segments; and on each side there is a thickened ridge, either limited to the clitellar rings or continued up on the rings nearly to the genital pores. Anal segment small, reddish, with tumid lips to the aperture. The genital pores are on the fifteenth ring, excluding the head in the enumeration. There are two similar pores on the twenty-sixth or twenty-seventh segment. The ventral bristles are black on the anterior segment; the other bristles are colourless or straw-yellow, stout, curved at the distal end, and rather bluntly pointed.

The surface is smooth and glistening, and reflects a beautiful blue iridescence, especially from the back. This iridescence is in some specimens very marked, in others it is less notable,—differences arising both from the condition of the worm itself, and from the nature of the soil in which it has been burrowing. The furrows behind the head are drawn from the one margin of the segment to the other, and the furrows are often connected by a cross line. The rings are divided into two halves by a faint line; and the bristles form two parallel series on each side. In one individual I counted 28 rings anterior to the clitellus, in another 30, and in another very large one 32. Ray says that there are 30 or 32. Otho Fabricius says that in his specimen there were 31, 6 in the clitellus, and 106 behind it—in all 143.

Müller, in three individuals, found the numbers to be:

Segments anterior to the clitellus.....	26	28	31
Segments in the clitellus	0	6	6
Segments posterior to the clitellus	100	99	80
Rings of the entire body	126	133	117

The description of this species by Ray is excellent.

This is our earthworm or dew-worm, the latter name bestowed from the animal coming forth from its concealment in the "dew-o'-the-morn," and before the sun has dried up the moisture of the ground. It lives in the soil of gardens, meadows, and pastures; frequents roads and pathways; and lurks, in crowds, under the pavement of the busy streets, gaining a difficult access to the surface through the chinks between the flags*. It cannot live either in pure sand or clay, nor in an over-wet soil, nor in peat. In pastures —new or old—it is often found under stones, lying in smooth runs which it has made for easy escape; for, on being disturbed, it retreats with sudden and stealthy quickness, and seems to be always on the alert. It will permit the body to be torn in pieces rather

* "Their favourite residence is a recent vegetable mould-heap, the under side of a flat stone in damp situations, and the earth immediately below half-dried cow-dung,—whence one of its provincial names, the Cow-dung worm."—*Dr. G. Douglas.*—"Quæ ratio est, quod non omnem terram, hoc est, tenuem, sterilem, arenosam, et lapidosam, sed tantum glarcosam, pinguem, et argillosam, ac humidam amat. Unde Anglia plurimos alit Lumbricos, quod sit regio humidissima."—*Aldrovandus, De Insect.* lib. vi. p. 693.

than have it dragged from the furrow; and the portion left behind, like the halves cut by the spade, wriggles with life and energy. A long continuance of dry weather is often fatal to a great number; the worm creeps from its hole, and dies miserably on the surface. In wet weather too, we often see these worms lying dead in pools of water—"pluviâ ejiciuntur è terrâ"—sodden and macerated, for the death is lingering, and the struggle may endure for two or three days*. "The earthworm is essentially a water-breathing animal; it dies in pure water from starvation, in dry air from asphyxia; the character of the circulatory fluids obviously suggests the above inferences."—*Dr. Williams, Rep.* p. 180. Anglers, in general, will not use this species for bait for trout†; but it is good to entrap eels; and salmon and bull-trout, when these are "out of season," or in a bad condition. Many birds prey upon it; and it is hunted incessantly by its prime enemy the mole. "Lumbricûm terrestrium adeo vorax est indagator, ut si spatulam ferream in humo infiges, et ea terram quatias, lumbrici hunc esse motum talpæ credentes, ad auras subitò ascendunt, et superficiei prorepunt. Qua arte, lumbrici facilè colligerentur pro usu piscatoris."—*Walker, Mam. Scot. in Essays*, p. 488.

White of Selborne has told, in a way better than I can do, some habits of this worm. "Earthworms," he says, "make their casts most in mild weather about March and April; they do not lie torpid in winter, but come forth when there is no frost‡; they travel about in rainy nights, as appears from their sinuous tracks on the soft muddy soil, perhaps in search of food.—When earthworms lie out a-nights on the turf, though they extend their bodies a great way, they do not quite leave their holes, but keep the ends of their tails fixed therein, so that on the least alarm they can retire with precipitation under the earth. Whatever food falls within their reach when thus extended, they seem to be content with, such as blades of grass, straws, fallen leaves, the ends of which they often draw into their holes§; even in copulation their hinder parts never quit their holes: so that no two, except they lie within reach of each other's bodies, can have any commerce of that kind; but as every individual is an

* "Earthworms immersed nineteen hours in oil, which is a fluid most destructive to all their race, revived when Spallanzani put them in humid earth."—*Tracts by Dalyell*, i. p. lii.

† "These worms are much more brittle than the Blackheads, and are also greasy and unpleasant to touch, even after the most careful purification. They are never used as a bait for trout when others can be obtained, but are the kind exclusively used for salmon-fishing in the latter part of spring and commencement of summer. A large bunch is fastened upon several hooks and dropped down a rapid stream: if the fish is there, he is sure to take."—*Dr. Geo. Douglas.*

‡ "Earthworms for the most part retreat deeper into the ground in winter to avoid the cold, but though not torpid are very lethargic and inert, and when touched do not display their usual fear; these, and slugs, seem, when disturbed, as if half awake out of a profound sleep."—*Bellamy's Nat. Hist. South Devon*, p. 401.

§ White is wrong in supposing these substances are for food. The earthworm feeds on earth,—the "succum terræ pinguem," to use the expression of Aldrovandus,—"in all probability," according to Derham, "earth made of rotted roots

hermaphrodite, there is no difficulty in meeting with a mate, as would be the case were they of different sexes.

"Earthworms, though in appearance a small and despicable link in the chain of Nature, yet, if lost, would make a lamentable chasm. For to say nothing of half the birds, and some quadrupeds, which are almost entirely supported by them*, worms seem to be great promoters of vegetation, which would proceed but lamely without them, by boring, perforating and loosening the soil, and rendering it pervious to rains, and the fibres of plants, by drawing straws and stalks of leaves and twigs into it†; and, most of all, by throwing up such infinite numbers of lumps of earth called worm-casts, which being their excrement, is a fine manure for grain and grass. Worms probably provide new soil for hills and slopes where the rain washes the earth away; and they affect slopes, probably to avoid being flooded. Gardeners and farmers express their detestation of worms; the former because they render their walks unsightly, and make them much work; and the latter because, as they think, worms eat their green corn. But these men would find that the earth without worms would soon become cold, hard-bound, and void of fermentation, and consequently sterile‡."

This species deposits its eggs in capsules at a considerable depth in the soil. They are laid in spring, and the young are hatched in summer, principally in the months of June and July. When of full size the capsule is as large as a pea, elliptical, with a tubulous aperture at one end, and a small point at the opposite pole. The shell is horny, elastic, smooth, and semitransparent: it is filled with a purulent-like matter, in which, in some capsules, no worm was visible; but in others the young worm was easily seen coiled up in the interior. The fœtal young escapes through the tubulous aperture, and is then rather more than an inch long, and in every respect like its parent, with the exception of there being no clitellus§. I have seen a young worm escape from the capsule, crawl about for a short

and plants, and such-like nutritive things, not pure earth."—*Phys. Theology*, p. 399, Lond. 1732.—They appear to eat also living rootlets, for we know that they injure plants grown in pots.

* See Aldrov. de Insect. lib. vi. pp. 646 & 697.

† "Soil is not loosened by boring through it, but rather rendered firmer in the parts not bored through. So far from being rendered permeable by water in consequence of the bores of worms, it is rendered less so, the worm-casts deposited on the orifices of the bores always being water-tight; so much so indeed, that, when lawns where worms abound are to be watered with lime-water in order to destroy them, the first step is to brush away the casts with a long flexible rod, or remove them with a rake, to let the water enter the bores."—*Loud. Gard. Mag.* xvii. p. 216.—The writer considers the opinion that worms add to the soil as "a delusion."

‡ The edition I quote from is the 8vo one, in 2 vols. Lond. 1825. Sir William Jardine has added an interesting note. See his illustrated edition, p. 152, Lond. 1853, 12mo.

§ Cuvier thus states Montègre's opinion:—"Selon M. Montègre, les œufs descendent entre l'intestin et l'enveloppe extérieure, jusqu'autour du rectum, où ils éclosent. Les petits sortent vivants par l'anus."—*Règ. Anim.* iii. p. 210. There is something not very intelligible in this; for how do the young obtain entrance into the rectum?

space, and then re-enter the empty matrix, wherein it disposed itself quietly in a coil*.

Earthworms when they emerge from the soil, and crawl about, have been long known to presage change of weather: "Item vermes terreni erumpentes."—*Plin. Hist. Nat.* lib. 18. sect. 88.

By the barber-surgeons and physicians of ancient times down to comparatively recent days, earthworms were often prescribed medicinally. Q. Seramis Samonicus, a physician of the age of Severus, deems it not beneath him to tell the young how to improve the hair:

> "Lumbrici quoque terrestres miscentur olivo
> Et juvenem præstant redivivo flore capillum."

And earthworms, boiled in goose-grease, are good for deafness; and the powder of them roasted helps decayed teeth. But their virtues are best given in the words of Dr. Bullein:—

"Earth wormes are hot of nature and of them are a pressious ointment made to close woundes, and if thei be sodden in goose greece and strained it is a good oyntment for to drop into a dull hearing eare, poring it in the contrarie side. Earth wormes stamped are good for payned teeth. The oyle of wormes be greatly commended for the comforting of the sinewes, jointes, vaines, and goute, thei must be washed in white wine, and the oiles of Verbascum or Cowslops, of Roses, of Lilles, of Dil, of Chamomill, all sodden together, whan it is colde put in your earth wormes, stoppe your glasse, let it stande xl daies in the sunne, then straine it, it will make an excellent oile against ache, sciatica, goute, &c. Reade more of them Plini lib. xxx. cap. ix. And thus I do ende of earth wormes, whiche are the bowels of the grounde or earth, whiche earth is colde and drie of nature, yet the mother of eche liuing wight, fostereth and geueth fode to euery creature, both sensible and insensible and remaineth still firme and stable, and eche creature hath his originall spring, and first life upon the earth, whan thei haue runne their race, some in pleasure and other some in wretchednes, the earth doeth deuoure them againe at length and swallow them, as though thei had neuer bene: and thus is generacion turned into corruption as Aristotle affirmeth†."

"After these follows properly the Worms, which some have called the intestines of the earth. These proceed immediately from the egg, and do not afterwards undergo any change, coming forth at their full perfection. The females, from their first hatching, have their little eggs, which are very distinct and perceptible. I observe

* The "eggs" described and delineated in Jones's Anim. Kingd. p. 209. fig. 85, belong evidently to a species different from our *L. terrestris*. The figures of Lyonet resemble ours.—*Lesser Insect Theology*, pl. 2. f. 1, 2; and so do those given by Dugès, which he says are the eggs of the *Lumbricus trapezoides*.—*Ann. des Sc. nat.* xv. p. 337. pl. 9. f. 6. See Williams, Rep. p. 261.

† The Booke of Simples, fol. xc.—See also Jonston, Hist. nat. de Insect. lib. iii. 198; and Paulus Ægineta by Adams, iii. 85. Aldrovandus de Insect. lib. vi. 695. Lesser Insect Theol. ii. 182.—The original storehouse is Plinii Hist. Nat. lib. xxx.

> "A day or two ye shul have digestives
> Of wormes or ye take your laxatives."—*Chaucer.*

that their genus may be divided into many species."—*Swammerdam, Book of Nature*, i. p. 27.

"Among all the eggs of insects, of which I have various species in my collection, I know none worthy of greater attention than those of Earthworms; for these insects have a red blood in their vessels, which, whilst the worm still lies in its egg, may be observed to move, and is wonderfully carried about in the heart itself. This is the reason why I take the present occasion to mention this singular phenomenon. Though the egg of the Earthworm is not larger than that of the Rhinoceros-Beetle, yet the former creeps out of it in form of a serpent, and is many times as long as it appeared in the egg. I saw two species of these eggs, of different sizes, and of an oblong-roundish figure, uniting on each side in a prominent point; and therefore one would be inclined to say that their microcosm or little world had two poles, and that one may hope to discover a great many wonders therein. They are of a pale yellow colour, and have a tinge of green. In the spring these eggs are found dispersed here and there in the earth. In order to hatch them properly, I put them into a dish, and covered them with white paper, which I always kept wet. If any person does this carefully in his chamber every day, he may very easily discover these wonders."—*Ibid.* p. 133.

Lumbricus minor (page 59).

In colour and shape this resembles a small dew-worm, but the posterior portion is only slightly compressed, often almost cylindrical, and it is not dilated near the end, nor is the anal segment deeper coloured. The head is a small obtusely rounded lobule overlooking the mouth, which has thick lips; and there are no furrows or impressed lines on the dorsum of the following ring. Clitellus with seven rings, each marked by its pores; and there is another or, as it were, a half-ring without a pore: but generally the rings in the clitellus are so coalesced or fused together that there is no perceptible line to mark the place of union, and the number is entirely conjectural. The generative pore is on the fifteenth ring. The setæ offer no peculiarity.

This species does not exceed 2 or 3 inches. The rings are not iridescent generally, but in some individuals I have seen the blue changeable lights appear, always however faint when compared with the dew-worm. It is an active wriggling species, and is considered a good bait for the trout, whence I have called it the Trout-worm. It may be found in gardens with its congener, but it prefers the moist gravelly ground at the sides of burns and rivers, where it is found under stones in profusion. My finest specimens have been got from the masses of confervæ, &c. which grow on the front of rocks over which water trickles. It is also often found in rotten wood, and at the roots of decayed vegetables; and it loves to lurk within the sheaths of the leaves of celery, lettuce, and leeks.

Body greenish, cylindrical or tapered towards the tail; the segments simple; clitellus about the middle of the body, of seven to

eight segments; second segment without furrows; vulvæ on the fifteenth or sixteenth. Length 2″.

There is what seems to be a variety of this, which may be named *virescens*, for it is distinguished by a dirty-green shade of colour (mountain-green), which is deepest on the part anterior to the clitellus and near the tail. The posterior portion is almost cylindrical, even to the end, where it rather tapers than dilates; and it appears to be often shorter than the anterior portion. I find also this hinder part to be frequently marked with some oily yellow spots mingled with the contents of the intestine, and very irregular and inconstant in position. But the peculiarity which as much as any other character distinguishes the variety is its inactivity. It is a dull creature that does not hurry away to escape, but throws itself into an imperfect coil, and lies thus for a few minutes. I find it under stones in pasture fields, at burn sides, and often under the droppings of cattle. The angler rejects it as worthless.

Lumbricus anatomicus (page 60).

This is equal to the dew-worm in size, attaining a length of at least 7 inches; but it is distinguished by its colour, softer and tougher texture, and by the posterior extremity being rounder and more tapered, for, although somewhat compressed, the tail is not dilated and scarcely spathulate. The portion of the body anterior to the clitellus is of a uniform dull umber-brown colour, and the posterior portion is a pale orange-brown, unmarked by the dorsal blood-vessel, but more or less dusked with the intestine. Head an obtuse lobule, and behind it there is a square or semioval space defined by an impressed line. Genital pores on the fifteenth ring. There is very often no clitellus, nor is it ever so distinctly marked as in *L. terrestris*; it consists of seven or eight rings, and there are thirty or thirty-one between it and the head. The anterior segments are nearly as long as their diameter, with two rings; the posterior are numerous and short, with one ring; and the anal is not more coloured than the rest. They are all striolate.

This appears to be distinct from *L. terrestris*, more especially in its habits. It is very common, and, to use the words of my young friend Dr. George Douglas, "is a true earthworm, neither requiring nor seeking manure for its habitat. It is a favourite for fishing, and is almost solely used in the Tweed when the river is small and the weather warm and bright. By being kept for a week or two in clean fog or moss, the worms become of a bright red colour, except the head, which is always more or less black, and very tough; so that many trout may be captured by the same worm, while other kinds are usually destroyed by the first nibble. In the height of summer these worms are found coiled up in button-like masses, bright red, and containing no earthy matter in the intestinal canal. They are then ready for use without undergoing the previous preparation of being kept in moss. The best are got in light gravelly soils."

Lumbricus fœtidus (page 61).

This is really a beautiful species, and well distinguished by its peculiar marking. In form and proportion it resembles the *L. terrestris*, but the largest specimen I have seen did not exceed 4 inches in length, and it is usually not more than about half that size*. The portion anterior to the clitellus is cylindrical, tapered to the head, reddish-brown with yellow dissepiments; the cephalic ring pale and obtuse, and the next marked with two abbreviate impressed lines confluent behind. There are twenty-six rings between the head and the clitellus, and the genital pore is on the sixteenth. The clitellus is composed of six rings. The posterior portion of the body has about sixty-four rings, is double the length of the anterior, is flattened, slightly tapered backwards, and not spathulate at the end. It is regularly and prettily annulated with chestnut-brown and yellow bands, which are nearly equal in diameter; and it is marked besides with golden-yellow oily dots, very irregularly distributed, and evidently produced by the contents of the intestine. The ventral surface is paler, and the bands do not encircle it.

When immersed in spirits the worm discharges a clouded fluid mixed with sulphur-yellow matter, and loses its irregular dots. At the same time there is exhaled a strong odour resembling that of burnt turves, and different from the nasty fishy smell exhaled from the living worm. I found it difficult to get rid of this smell,—a fact also mentioned by Dr. G. Douglas. "When fresh they exude, if touched, a yellow pungent fluid of a very disagreeable and peculiar odour, which stains the fingers, and leaves a smell which cannot easily be got rid of for many hours."

These worms are much prized by the angler for poking in the smaller streams, as *e. g.* the Kale, the Jed, and the Beaumont; nor do the trout of the Tweed and Whiteadder resist the bait, albeit they love it less than the Blackhead. But all anglers praise the Brandling, and some have sung it in immortal verse:—

> "You must not every worm promiscuous use,
> Judgment will tell the proper bait to choose:
> The worm that drags a long immoderate size,
> The trout abhors, and the rank morsel flies;
> And, if too small, the naked fraud 's in sight,
> And fear forbids, while hunger does invite.
> Those baits will best reward the fisher's pains,
> Whose polish'd tails a shining yellow stains:
> Cleanse them from filth, to give a tempting gloss,
> Cherish the sullied reptile race with moss;
> Amid the verdant bed they twine, they toil,
> And from their bodies wipe their native soil."
>
> GAY, *Rural Sports*, Canto i.

> "Sae ye'se put on your sawmon-roe,
> Whiles I a gowd-tail'd Brandlin' try;
> She 's comin down, a bonnie brown,
> —We'se cheat them a', an' up the Wreigh."
>
> *Coquet-Dale Fishing Songs*, p. 109.

* Dr. G. Douglas says that 2½ inches is about the length of the largest; but one of the specimens he sent me was fully 3 inches.

ENCHYTRÆUS (page 63).

This little worm is found lying rolled up in a loose spiral manner. It cannot live except in moist places. When placed on the hand it writhes painfully, and soon dies. "In humidiusculis commode repit, in siccas valde sese torquet, ac defectu humidi brevi intabescendo perit."—*Müller.*

Enchytræus vermicularis (page 63).

This worm is unspotted. There is, on many specimens, a milk-white spot near the fore part of the body, but it seems rather to indicate the position of the stomach than to be a clitellus. A much-convoluted intestine runs through the entire length of the body, and it is divided into rings by strictures corresponding to those in the skin. This intestine is not red. The sides, when highly magnified, appear thickened rather than crenulate.

Sænuris tubifex (page 64).

Body filiform or very slightly tapered towards the posterior end, smooth, pellucid, annulose, with a vessel of a fine red colour and a dusky intestine running tortuously from one end to the other, each making a twist in every ring: hence the worm appears red in the water, for the immersed half is a pale straw-yellow. Mouth inferior, subterminal, the apex somewhat pointed. Rings each with four small fascicles of bristles, four in every fascicle; they are simple, setaceous, entirely retractile, and one on the ventral aspect longer than the others. Anus terminal, truncate.—When highly magnified the margins are seen to be finely crenulated; and when the worm is killed by sudden immersion in spirits, the rings of the anterior half become separated by such a deep stricture that it may be described as moniliform or beaded. The series of bristles on two sides are obvious, but to perceive the four it is necessary to compress the body between plates of glass. Length nearly 1 inch; as thick as good sewing-thread.

This little worm lives in a short cylindrical tube formed in the soft mud at the bottom of its pools. It frequents especially little pools at the side of rivulets. It is gregarious, and during the summer attracts notice by the vivid red of its moving groups; for, having the anterior half immersed, it stretches up the posterior, and waves it to and fro with a sort of circular serpentine movement that reminds one of a perpetual motion. The worm is very watchful and alert. When any one approaches unwarily, or the water is disturbed, the whole community instantly disappear, sinking in the tubes; nor do they reappear until after a considerable interval of quietness. The tubes dissolve on a very slight agitation, and cannot be taken up entire. The worm itself is the favourite food of the Hydra.

It lives, says Hoffmeister, buried in the mud with the posterior

extremity of the body, while the front portion projects freely and floats about in the water. But Bonnet asserts the contrary: "Au reste, c'est la partie postérieure du ver qui sort hors du tuyau, et qui s'agite continuellement en divers sens: l'antérieure demeure toujours cachée dans la boue."—*Bonnet, Insectol.* ii. 182.

Müller says that his *Lumbricus tubifex* is "bifariam aculeatus;" but the description in other respects agrees so well with our worm, that I have not hesitated about the name.

Sænuris vagans (page 65).

I find this minute worm in abundance in the soil under the moss on rocks over which water trickles. It creeps quickly enough in the soil, but makes slow progress in pure water, where it wriggles and bends itself into a simple curve. From the simplicity of its structure it might be referred to the *Naides*, but the bristles are curved.

Head obtusely pointed; mouth inferior, between it and the second segment, without a proboscis. Body filiform, smooth and even, equal at both extremities, consisting of about fifty equal segments divided by a simple line; anal segment obtusely pointed. Intestine regularly segmented, without any lateral cæca: no distinctly separated stomach. Segments armed with spinets only, in four series, fasciculate, with from three to eight spinets in each fascicle, fan-shaped: there are a greater number of spinets in the ventral series than in the dorsal, even on the same segment. The spinets are colourless, slightly bent, acute at the outer extremity, much shorter than the diameter of the segment.

Sænuris variegata (page 65).

Body from an inch to 2 inches long, slender, filiform, narrowed a little at each end, chiefly so at the anterior, smooth, annulose, of a reddish-brown maculated colour, with a vessel of a fine ruby-red colour running down the middle; the sides straw-yellow and finely crenulate. Anterior end acute, pale; and the posterior extremity is often also colourless. The bristles are very short and retractile; they are in four series, and there are about four bristles in every fascicle.

The natural or ground colour of the body seems to be a straw-yellow; and the red is variable in extent, and in the character of the markings. The intestine is divided, like a vertebral column, by a series of strictures corresponding to the rings; and from these strictures there is sent off, to each side, several filiform cæca, which form a series of quadrangular brown spots arranged along each side of the central aspect—"utrinque maculis quadratis pinnata*." These spots are often very obvious, but only in individuals which seem to have wanted food for some time; and more commonly the spots are

* "This worm is remarkable by its vascular system. The dorsal vessel in it, at each segment, gives off a branch at right angles, which terminates in a digitate manner in cæcal twigs, as in fact Treviranus had already noticed."—*Rep. on Zool., Ray Soc.* 1847, p. 510.

large, appearing almost to coalesce, and losing altogether the regular pinnate character. Even in these specimens the cæca can be made easily visible by slight compression between plates of glass. The colour of the central vessel is always alike, and the irregular movements of a fluid in it are very perceptible. There is, in most specimens, an indentation, more or less deep, on some part of the body —the beginning probably of a separation.

Clitellio arenarius (page 67).

Worm 6 lines long, slender, filiform, slightly narrower at each end, of a reddish colour to the naked eye, smooth, annular, with faint line-like dissepiments, the sides thickened and neatly crenulated. Rings about equal in length to their diameter. Head lanceolate, the mouth inferior. The anal extremity obtuse, deeply sinuate, mutable in form; for the little prominences which bound the sinus can be opened wide or shut at pleasure. Bristles in four series, equidistant, from two to four bristles in each series; the bristles are minute, entirely retractile, curved like an italic *f*, and sharp at the point.

This worm is not capable of shortening and lengthening the body, but it writhes and wriggles about, rolls itself into more or less complete spirals, and progresses like an earthworm by aid of its bristles. When magnified, the body may be described as a sort of transparent whitish tube, containing a red spiral blood-vessel, and a larger dusky intestine, so wreathed and twisted together that they are only seen separate at certain undetermined places. The anterior and posterior portions are paler than the middle, and the rings and bristles there more distinctly visible. The intestine is constricted at regular intervals, the portion between the strictures longer than broad, and rough or granulous, and filled with earthy matter.

This little worm lives in wet gravel or sand on the shore where the water is brackish. It seems to be common. It lives without apparent inconvenience in fresh water. That the bristles are in four series is only to be discovered when the body has been compressed.

The skin of this worm is a clear very faint yellow, so that the red colour of the body depends on its blood-vessels, which run from one extremity to the other; one large vessel on each side of the intestine, uniting in the anterior segment, and being much slenderer there than they are lower down. The vessels and intestine are straight or tortuous, according to the state of the worm as to its contraction or expansion: the latter is usually filled with earthy matter, but is pale or empty at the divisions between the rings. When contracted, the sides are minutely crenulate. The mammiform papillæ are obviously connected with the generative function, and are not always present. I have seen them, in a great number of individuals, fully developed in January; and the ring to which they belong, as well as the one above and below it, are filled with a milk-white matter, over which some fine branchlets of the blood-vessels ramify, and the skin is thickened at the part.

Clitellio arenarius resides in places similar to *Sænuris lineata*, and is equally common. When thrown into fresh water it is evidently pained, and soon dies. Cuvier has placed it in a section of his genus *Nais* (*Règ. Anim.* iii. p. 212), but the propriety of this collocation may be doubted; and it will be better to retain the Müllerian name until the allied species, several of which have not yet been described by any one, are better known.

The spinules are very short, not half the diameter of the body, and apparently entirely retractile; they are colourless, curved like an italic *f*, and resemble those of the common earthworm, being proportionably stout. There are two only in the feet of the few anterior segments, and three or four where most developed.

Valla ciliata (page 68).

Hab. "It lurks constantly in the sand of the shore at about half tide, whence the head is protruded, waving to and fro."—*Dalyell.*

This worm is found under stones, between tide-marks, in a wet sand mixed with a little clay. It often lies fully extended, and it moves forwards and backwards with equal ease*. When crawling it can return upon itself, when the reverted anterior half lies parallel with the posterior, and the two extremities move in opposite directions. It is very contractile, and frequently collects a portion of the body into partial knots or swellings, and will again extend itself to a great length, until it becomes as slender as sewing-thread. Its red colour is very generally diffused, and to the naked eye no vessels are visible; but when placed under the magnifier and carefully observed, the blood may be seen propelled to and fro through vessels, one of which runs along each side of the intestine. The blood is grumous, and nothing can be more irregular than its course, now driven in one direction, then in the opposite, and then again settling at rest; for its motion seems to be dependent on the motions of the body and the extension of the rings. The intestine is, as usual, large, and deeply constricted at every joint; it is usually filled with earthy matter, and, when this is pressed out, it still appears dusky, and somewhat reticulated in a very minute manner. I have never seen any specimens with a belt, such as we see in the common earthworm. The number of tufts of bristles is hard to be correctly ascertained, but there appear to be four on each segment; and towards the middle and posterior part of the body they issue from a very evident cordate or roundish tubercle, which is not obvious on the anterior segments.

Müller says that his *Lumbricus ciliatus* is only 9 lines in length, but he had never seen a living specimen. It was sent to him from the shores of Norway.

* "In crawling, the segments enlarged at the place of their union; and it is a peculiar feature, that a kind of intumescence appeared at intervals as the body advanced, the portion thus enlarged being vivid red, while the vicinity became pale, and this intumescence was transmitted along the body."—*Dalyell.*

Fam. III. NAIDES (page 69).

The *Naides* have been recently (1837) raised to the rank of a separate class, under the name *Somatotoma*: see *Ann. des Sc. nat.* vii. p. 101 (1847). Schmidt considers this a right proceeding: see his interesting "Observations sur l'anatomie et la physiologie des Naïdes," in *Ann. des Sc. nat.* vii. p. 189.

Nais scotica (page 71).

Body transparent, the anterior portion cylindrical, rounded and obtuse at the end. Bristles shorter than the diameter of the body, more than one in the place of insertion.

"In some a yellow globule is seen towards the anterior, and in one or two, white spherules have appeared.

"The food may be the minute *Entomostraca*, as a specimen of the *Cypris* appeared in the intestine. This last organ is of variable form, being divided into several sacs, of alterable appearance and numbers.

"The transparence of the animal completely exposes the internal conformation.

"It dwells among the roots of the *Iris* and *Equisetum*, not very far from the surface of lakes and ponds."—*Dalyell.*

It resembles *Nais elinguis* of Müller, but in this the bristle is solitary, or there is one only from the same point; and *N. scotica* differs from *N. barbata* in the form of the head, in the absence of eyes, and in the bristles, which in *N. barbata* exceed the diameter of the body.

SUPPLEMENT,

CONTAINING

ADDENDA AND CORRIGENDA

AND

ADDITIONAL SPECIES.

Page 16, *after* Convoluta paradoxa *add* Plate I. fig. 2, *a*, *b*.

Page 17, *after* Planária hirudo *add* Plate I. fig. 3.

Page 19, *after* Astemma rufifrons *add* Plate II. *b*. figs. 4, 5. Fig. 4, natural size; fig. 5, portion of anterior extremity, magnified.

Page 19, *after* Astemma filiformis *add* Plate I. fig. 1, *a*, *b*.

Page 20, *after* Tetrastemma varicolor *add* Plate II. *a*. fig. 4, nat. size.

Page 21, *after* Borlasia olivacea *add* Plate II. *b*. figs. 1, 1*, 1**. Fig. 1, 1, 1, nat. size; 1*, anterior and middle parts, magnified; 1**, embryo?

Page 21, *after* Borlasia octoculata *add* Plate II. *b*. figs. 2, 2*. Fig. 2, nat. size; 2*, anterior portion, magnified.

Page 21, *after* Borlasia purpurea *add* Plate II. *b*. figs. 3, 3*. Fig. 3, nat. size; 3*, head, portion of middle, and tail, magnified.

Page 22, *after* Omatoplea gracilis *add* Plate II. *a*. figs. 1, 1*. Fig. 1, nat. size; 1*, anterior portion, magnified.

Page 23, *after* Omatoplea rosea *add* Plate II. *a*. figs. 2, 2*, 2**, 3, 3*. Fig. 2, nat. size, both figures; 2*, anterior portion, magnified; 2**, caudal extremity, magnified; fig. 3, O. rosea, var. brunnea, nat. size; 3*, head, magnified.

Page 23, *after* Omatoplea melanocephala *add* Plate II. *a*. figs. 5, 5*. Fig. 5, nat. size; 5*, magnified.

Page 24, *after* Omatoplea pulchra *add* Plate II. *a*. figs. 6, 6*. Fig. 6, nat. size; 6*, magnified.

Page 26, Lineus murenoides, *after Description, for* Length 3–6″ *read* 3–6′; *and for* thickness 2″ *read* 2‴. *Delete* Plate I., *and after* (*e*) Falmouth, *W. P. Cocks, add* (*f*) Polperro, Cornwall, *Laughrin.*

Page 27, Lineus fasciatus, *delete* Plate II., *and after* (*c*) Falmouth *add* (*d*) Polperro, Cornwall, *Laughrin.*

Page 27, Lineus viridis, *after* (*a*) Falmouth, *W. P. Cocks, add* (*b*, *c*) Polperro, Cornwall, *Laughrin.*

Page 27, Lineus albus, *add* (*a*, *b*, *c*) Polperro, Cornwall, *Laughrin.*

Page 28, Meckelia annulata, *after* (*d*) Berwick Bay, *Dr. Johnston, add* (*e*) Montrose, *W. Beattie.*

Page 29, *after* Serpentaria fusca *add*

Sp. 3. **Serpentaria Beattiei.**

Lineus Beattiæi, *Gray, Proc. Zool. Soc.* 1857, 210. t. 48.

In length this worm was from 18 to 20 inches, and had the faculty of dividing itself into numerous pieces. The upper portion, containing the head, was the only part preserved and sent to the British Museum by Mr. Beattie of Montrose. As Dr. Gray observes, "the specimen is in far too imperfect a condition to describe, but I think it may be provisionally named *Lineus Beattiæi*, after its discoverer." The fragments, in spirits, are of a dull greyish-white colour, and the head exhibits "a large longitudinal mouth, opening into a longitudinal cavity, which extends the whole of its length, having a central, broad, longitudinal rounded ridge extending the whole length of the dorsal surface."

Query—May it not be synonymous with *Serpentaria fragilis*, Goodsir?

Page 32, *after* Entobdella hippoglossi *add* Plate XII. figs. 1–3.

Page 33, *after description of* Capsala Rudolphiana *add* (*a*) From the gills of the *Orthagoriscus mola*, Co. Galway, *Capt. Bedford, R.N.*

Page 40, Pontobdella muricata, *after* (*k*) Weymouth, *W. Thompson, add* (*l*) From a Skate, London market, *Mr. Olliffe*; (*m*) Donegal, Ireland, *Earl of Enniskillen.*

Page 42, *after* Pontobdella littoralis *add* Plate I. figs. 4–6.

Page 43, Piscicola geometra, *after Obs. add* (*a*) On the Trout, River Wandle, *J. Gould.*

Page 45, Nephelis octoculata, *after* (*a*) The Whiteadder, Berwickshire, *Dr. Johnston, add* (*b*) Holy Island, *Dr. Johnston.*

Page 51, Glossiphonia verrucata, *after* (*a*) Cobham, Surrey, *add* (*b*) Eton, *Dr. J. Goodall.*

Page 52, Glossiphonia sexoculata, *after* (*a*) The Whiteadder, Berwickshire, *Dr. Johnston, add* (*b*) Holy-Island Loch, *Dr. Johnston.*

Page 53, sp. 7, *for* G. flava *read* G. marginata, *and add as synonyms—*

Hirudo marginata, *Müller, Hist. Verm.* i. 2. 46. *Schrank, Fauna Boica,* iii. 2. 162. *Baer, Nov. Act. Acad. Cæs. Nat. Cur.* xiii. 2. 727. tab. xxxii. f. 10.

Hirudo variegata, *Braun, System. Beschr. einig. Egelart.* 61. tab. vii. f. 1–6.

Hirudo cephalota, *Carena, Mem. dell'Accad. di Torino,* xxv. 298–316. tab. xii. f. 12–19, et tab. xxviii. f. 336.

Hirudo oscillatoria, *Saint-Amans, Mém. Soc. Linn. de Paris,* iii. 193. tab. viii.

Piscicola marginata, *Moquin-Tandon, Monogr. des Hirudin.* 132. tab. vii. f. 2.

Piscicola tessellata, *Moquin-Tandon, l. c.* 133. tab. vii. f. 3 (exclus. synon. Hirudo tessellata, *Müller*).

Hirudo (Glossobdella) cephalota, *Blainville, Dict. Sc. Nat.* xlvii. 266.

Ichthiobdella marginata, *Blainville, l. c.* lvii. 558.

Clepsine marginata, *Müller, Wiegmann's Archiv,* 1844, 371–376 (et anat.). *Diesing, System. Helminth.* i. 447.

Glossiphonia marginata, *Moquin-Tandon, Monogr. des Hirudin.* nouv. édit. 375–379. tab. xiv. f. 10–20. *Houghton, Ann. & Mag. Nat. Hist.* 3rd ser. v. 1860, p. 248. tab. xvi. C. f. 1 & 2.

Hirudo flava, *Dalyell, ut citat.*

After Hab. add Bala Lake, and brook near Solihull, Warwickshire, *Rev. W. Houghton.*

Page 59, Lumbricus terrestris, *after* (*c*) Berwick Bay, *Dr. Johnston, add* (*d*) Kingston-on-Thames, *Dr. A. Günther.*

Page 69, Proto digitata, *in synon. after* P. digitata, *Oersted, add Houghton, Ann. & Mag. Nat. Hist.* 3rd ser. vi. 1860, 393. figs. 1, 2 (woodcut). *After Hab. add* Malvern Park, Solihull, Warwickshire, *Rev. W. Houghton.*

Page 104, Aphrodita aculeata, *after* (*c*) Berwick Bay, *Dr. Johnston, add* (*d*) Brighton, *R. Hudson*; (*e*) Lincolnshire, — *Maughan*; (*f*) No locality, *J. W. Lubbock*; (*g*) Brighton; (*h*) Hastings; (*i*) Sandgate, Kent, *Mus. Leach*; (*j*) Sandgate, Kent, *Rev. Ger. Smith*; (*k*) Firth of Forth, *Mus. Leach*; (*l*) Weymouth, *Damon.*

Page 107, Aphrodita hystrix, *after* (*a*) The English Channel, *Joshua Alder, add* (*b*) Falmouth, *J. Cranch*; (*c*) Weymouth, *Dr. Bowerbank*; (*d*) Weymouth, *Damon.*

Page 109, Lepidonotus squamatus, *for* Plate VII. *read* Plate VIII.: *and* Page 111, *after* (*f*) Aberystwith, *J. Henslow, add* (*g*) Leith, *Dr. Macdonald*; (*h*) Polperro, Cornwall, *Laughrin*; (*i, j*) British coast, *Zool. Soc. Coll.*

Page 112, Lepidonotus clava, *before* See figs. 5 & 6, *add* Plate IV.; *and after* (*b*) Falmouth, *W. P. Cocks, add* (*c*) South Devon, *G. Montagu*; (*d–f*) Polperro, Cornwall, *Laughrin*; (*g*) No locality.

Page 114, Lepidonotus pharetratus, *after Obs. add* (*a*) Scotland, *Lieut. Thomas, R.N.*; (*b*)? Firth of Clyde, *D. Robertson.*

Page 114, Lepidonotus cirratus, *for* Plate III. *read* Plate VIII.: *and* Page 116, *after* (*d*) Wick, Caithness, *C. W. Peach, add* (*e*) Scotland, *Dr. Johnston*; (*f, g*) Polperro, Cornwall, *Laughrin*; (*h*) juv., Polperro, *Laughrin*; (*i*) Firth of Clyde, *D. Robertson.*

Page 116, Lepidonotus semisculptus, *after* Length and breadth *add* Plate V. figs. 1–11, and Plate VI. figs. 4–6.—Page 117, *after* (*a*) South coast of Devon, *J. Cranch, add* (*b*) Guernsey, *J. Smith.*

Page 117, Lepidonotus pellucidus, *after* Length *add* Plate VII. figs. 1–10.

Page 118, Lepidonotus imbricatus, *after Description add* ? (*a*) Firth of Clyde, *D. Robertson*; ? (*b*) Polperro, Cornwall, *Laughrin.*

Page 119, Polynoë scolopendrina, *for* Plate IV. *read* Plate XI.

Page 122, Pholoë inornata, *for* Plate V. *read* Plate XIII.; *and after Description add* (*a*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 122, Pholoë eximia, *after* Length *add* Plate VI. figs. 1–5. Fig. 1, animal, magnified; fig. 2, a scale, one of upper twelve; fig. 3, one of the ventral bristles; fig. 4, one of the jaws; fig. 5, one of the dorsal bristles.

Page 124, Sigalion boa, *for* Plate V. *read* Plate XIII.; *and* Page 125, *after* (*e*) Loch Torridon, *R. M'Andrew, add* (*f, g*) Great Britain, *Dr. Johnston*; (*h–k*) Polperro, Cornwall, *Laughrin.*

Page 127, Euphrosyne foliosa, *after Description add* (*a*) Tenby (a mutilated specimen); (*b*) Firth of Clyde, *D. Robertson.*

Page 127, Euphrosyne borealis, *after Obs. add* (*a*) Scotland, *Dr. Johnston*; (*b*) No locality, *Old Collection.*

Page 127, Spinther oniscoides, *for* Plate VI. *read* Plate XIV.

Page 131, Eunice annulicornis. This is most probably not a British species. It is the *E. annulicornis* of Maximilian Spinola, but not described by him. It is very likely, from the label upon the bottle, to have been sent to the Museum by Spinola, and is perhaps a native of the Gulf of Genoa.

Page 133, Eunice Harassii. *At bottom of page add* (*b*) Falmouth; (*c*) Polperro, Cornwall, *Laughrin.*

Page 135, Eunice sanguinea, *after* (*f*) Falmouth *add* (*g–i*) Polperro, Cornwall, *Laughrin.*

Page 138, Northia tubicola, *after* (*b*) Scotland, *Lieut. Thomas, R.N.*, *add* (*c*) Polperro, Cornwall, *Laughrin*; (*d*) Cumbrae, Firth of Clyde, *D. Robertson*; (*e*) Falmouth, *W. P. Cocks.*

Page 139, Northia conchylega, *after* (*b*) South Devon, *J. Cranch*, *add* (*c*) Firth of Clyde, *D. Robertson.*

Page 140, Lycidice Ninetta, *after* (*b*) Falmouth *add* (*c*) Polperro, Cornwall, *Laughrin.*

Page 141, Lycidice rufa, *after* (*a*) Falmouth *add* (*b*) Polperro, Cornwall, *Laughrin.*

Page 143, Lumbrineris tricolor, *after* (*b*) South Devon, *J. Cranch*, *add* (*c–j*) Polperro, Cornwall, *Laughrin.*

Page 148, Nereis brevimana, *after* (*b*) Ayrshire, *P. W. Maclagan, M.D.*, *add* (*c*) Polperro, Cornwall, *Laughrin.*

Page 151, Nereis pelagica. The specimens from (*a*) to (*e*) have by accident been transposed from the following species, *N. diversicolor*, to which they belong. *After* (*e*) *add* (*f–l*) Polperro, Cornwall, *Laughrin.*

Page 154, Nereis diversicolor. The specimens from (*a*) to (*e*) have by accident been transposed from *Nereis pelagica*, to which they properly belong. *After* (*e*) *add* (*f*) Wick, Caithness; (*g*) British coast, *Dr. Baird*; (*h*) Polperro, Cornwall, *Laughrin.*

Page 155, Nereis cærulea, *after* (*b*) Falmouth *add* (*c*) Falmouth, *W. P. Cocks.*

Page 156, Nereis fimbriata, *after* (*d*) Falmouth *add* (*e*) Polperro, Cornwall, *Laughrin.*

Page 158, Nereis Dumerilii, *after* (*b*) Barmouth, Merionethshire, *C. Stokes*, *add* (*c*) Polperro, Cornwall, *Laughrin.*

Page 163, Heteronereis lobulata, *after* (*b*) Falmouth *add* (*c, d*) Polperro, Cornwall, *Laughrin.*

Page 167, *after description of* Heteronereis margaritacea *add*

Sp. 5. **Heteronereis signata.**

Heteronereis signata, *Baird, Proc. Linn. Soc.* 1864, tab. i. f. 1.

Body pyramidally shaped, spotted, channeled on both dorsal and ventral surfaces; 2nd, 3rd, 4th, and 5th segments very short, the following 16 segments large, strong; the feet simple; the segments of posterior portion of body small and narrow, and very crowded, the feet compound; the cirri of the anterior feet simple, not crenated.

Hab. British coast, on a muddy bottom.

(*a*) Polperro, Cornwall, *Laughrin.*

Page 171, Nephthys cæca, *after* (*e*) Littlehampton, Sussex, *Mus. Leach, add* (*f*) Cumbrae, Firth of Clyde, *D. Robertson*; (*g*) Gairloch, *D. Robertson.*

Page 177, Phyllodoce lamelligera, *after* (*d*) South Devon, *G. Montagu, add* (*e, f*) Polperro, Cornwall, *Laughrin*; (*g*) Britain, *Mr. Sowerby.*

Page 177, *after* Phyllodoce maculata *add* Plate XIV. *a.* figs. 1–3.

Page 179, Phyllodoce viridis, *after* (*b*) Holy Island, *Dr. Johnston, add* (*c–g*) Polperro, Cornwall, *Laughrin.*

Page 182, Psamathe punctata, *for* Plate XIV. *read* XIV. *a.*

Page 186, Glycera dubia, *after* (*a*) South Devon *add* (*b*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 186, Glycera capitata, *for* Plate XV. *a. read* XV. *b*; *and* Page 187, *after* (*a*) South Devon *dele* (*b*) Aberystwith, *J. Henslow, and transfer it to* Glycera alba *in this Supplement. After* (*c*) Holy Island, *Dr. Johnston, add* (*d*) Firth of Clyde, *D. Robertson.*

Page 189, *after* Glycera nigripes *add*

Sp. 5. **Glycera setosa.**

Glycera setosa, *Oersted, Grœnl. Ann. Dors.* 46. tab. 7. f. 88, 95, 97.

Without branchiæ; rings of the head-lobe with a small papilla on each side; segments triannulate; bristles very long.—*Grube.*

Hab. Coast of Cornwall.

(*a*) Polperro, Cornwall, *Laughrin.*

Sp. 6. **Glycera alba.**

Nereis alba, *Müll. Zool. Dan.* ii. 29. tab. 62. f. 6, 7.
Glycera alba, *Oerst. Ann. Dan. Conspect.* p. 23. f. 24, 103, 105, 110 (1843). ? *Rathke, Nov. Act. Acad. Cæs. Nat. Cur.* xx. pt. 1. p. 173. tab. 9. f. 9 (1843), nec *Johnston, Ann. & Mag. Nat. Hist.* 1845, xv. 147. *Grube, Famil. der Anneliden*, p. 60.

With short simple branchiæ, placed on the dorsal margin of the pinnæ, from the 23rd segment to the end of the body.—*Grube.*

Hab. Coast of Wales and Cornwall.

(*a*) Aberystwith, *J. Henslow.*
(*b, d, e*) Polperro, Cornwall, *Laughrin.*
(*c*) var. Polperro, Cornwall, *Laughrin.*

Page 192, Syllis cornuta, *after Obs. add* (*a*) Polperro, Cornwall, *Laughrin.*

Page 195, Gattiola spectabilis, *for* Plate XVI. *read* XVI. *a*; *and after* Syllis tigrina, *Gosse, add* Gattiola spectabilis, *Baird*, Art. *Annelida in Mus. Nat. Hist.* vol. ii. p. 298 (note), 1861.

Page 197, Ioida macrophthalma, *for* Plate XIV. *read* Plate XIV. *a*.

Page 210, Cirratulus tentaculatus, *after* (*a*) South Devon, *G. Montagu*, *add* (*b*) Falmouth, *W. P. Cocks*; (*c–g*) Polperro, Cornwall, *Laughrin*.

Page 212, Cirratulus borealis, *after* (*a*) South Devon, *G. Montagu*, *add* (*b*) Falmouth, *W. P. Cocks*; (*c*, *d*) Berwick, *Dr. Johnston* (=Cirratulus flavescens, *Johnst.*); (*e–k*) Polperro, Cornwall, *Laughrin*.

Page 212. *Introduce here, before* Genus DODECACERIA,

Genus **AONIS**, *Savigny* (*Aud. & Edw.*).

Tentacle one, or none; tentacular cirri wanting; setiferous processes of all the segments similar, two-rowed; branchiæ short, lancet- or tongue-shaped.—*Grube*.

Sp. 1. **Aonis vittata.**

Aonis vittata, *Grube, Famil. der Anneliden*, p. 69.

One median tentacle; branchiæ lingulate, at first leaving the greater part of the back free, wrinkled on the outer margin, afterwards gradually lengthening and becoming filiform.—*Grube*.

Hab. Scotland and England.

(*a*) Loch Goil Head, Firth of Clyde, *D. Robertson*.

(*b*) Polperro, Cornwall, *Laughrin*.

Page 214, *before* Tribe II. LIMIVORA, *introduce*

Family **CHÆTOPTERIDÆ.**

Body vermiform, somewhat cylindrical or depressed, consisting of several differently formed divisions, which are again subdivided into segments. Head-lobe flat and short, with two tentacula on the underside. Buccal segment furnished with pinnules. Mouth directed forwards; trunk (proboscis) wanting. Lateral processes of the segments consisting of simple pinnules armed with a row of flat bristles, but not present on all the segments.—*Grube*.

Genus **CHÆTOPTERUS**, *Cuvier*.

As there is only one British genus belonging to this family, the characters given above will suffice.

Sp. 1. **Chætopterus insignis.**

Chætopterus insignis, *Baird, Trans. Linn. Soc.* xxiv. 477. tab. xlix. f. 1 & 2.

Anterior portion of the body square-shaped, broad, flattened, or somewhat convex on the ventral surface and slightly concave on the

dorsal; composed of 11 segments. Tentacula long and channeled. Fourth segment of anterior portion of body broader than the others, and furnished on the ventral surface with a row of stout black setæ. The feet of the 10th segment are long and lanceolate-shaped. Middle portion of body cylindrical, and composed of four segments, which are in the form of sacs or vesicles. The posterior portion of the body consists of from 13 to 23 segments, which gradually diminish in size as they descend, the last 6 or 8 being very small and closely crowded together. The animal inhabits a thin parchment-like tube coated externally with sand and gravel.

Hab. Coasts of Great Britain; Channel Islands.

(*a*) Island of Guernsey, *Mrs. Mauger.*
(*b*) Island of Herm, Channel Islands, *J. Smith.*
(*c*) Cumbrae, Firth of Clyde, *D. Robertson.*
(*d*) Polperro, Cornwall, *Laughrin.*
(*e*) Falmouth (tube only), *W. P. Cocks.*
(*f*) Herm, Channel Islands (tubes), *J. Smith.*
(*g*) Beaumaris, Isle of Anglesey (animals and tubes), *J. Williams.*

Obs. The true place in the systematic arrangement of Annelides for the family *Chætopteridæ* has been much misunderstood. Oersted some years ago divided the large family *Ariciidæ* into two sections, which he has distinguished by the names of *Ariceæ veræ* and *Ariceæ Naideæ*. Sars and other more recent authors consider that these two sections ought to be raised to the rank of distinct families; and they may be called *Ariciidæ* (s. str.) and *Spionidæ*.

Between these two families Carus has more recently still arranged the family *Chætopteridæ*; and certainly the animals belonging to this family have much more analogy with those of the *Spionidæ* than with any other group of Annelides. In the present Catalogue, however, it has been considered sufficient to introduce the family *Chætopteridæ* (now for the first time made known as British) in its present place, at the end of the *Ariciidæ*, before the commencement of the Tribe *Limivora*. (For a more complete view of the reasons for assigning the place for the *Chætopteridæ* close to the *Ariceæ*, see paper in Trans. Linn. Soc. xxiv. pt. 3, 1864.)

Page 217, Ophelia acuminata, *after* (*b*) Cullercoats, *J. Alder*, &c., *add* (*c*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 221, Travisia Forbesii, *after description of* Plate XIX. *add* (*a*, *b*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 223, Siphonostoma uncinatum, *after* (*a*) Tenby, S. Wales, *F. D. Dyster*, *add* (*b*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 231, Arenicola piscatorum, *after* (*g*) Berwick Bay *add* (*h–j*) Holy Island, *Dr. Johnston*; (*k*) Cumbrae, Firth of Clyde, *D. Robertson*; (*l*) Polperro, Cornwall, *Laughrin.*

Page 231, Arenicola branchialis, *after* (*d*) Falmouth *add* (*e*, *f*) Polperro, Cornwall, *Laughrin.*

Page 232, Arenicola ecaudata, *after Obs. add* (*a*) Polperro, Cornwall, *Laughrin.*

Page 233, *after description of* Sp. 1. Clymene borealis *add*

Sp. 2. **Clymene lumbricalis.**

Clymene lumbricalis, *Aud. & Edw. Cuv. Règne Anim.*, ed. *Crochard, Annelid.* pl. 22. f. 2. *Grube, Famil. der Annelid.* p. 77.

Plate of the head-lobe broad, projecting from the sides; denticulations of the funnel-margin 36, alternately longer and shorter; funnels without furrows; anal papillæ in a single circle.—*Grube.*

Hab. Coast of Scotland.

(*a*) Cumbrae, Firth of Clyde, *D. Robertson.*

Page 235, Terebella conchilega, *after* (*a*) No locality *add* (*b*, *c*) Polperro, Cornwall, *Laughrin*; (*d*, *e*) Falmouth (tubes only), *W. P. Cocks.*

Page 236, Terebella littoralis, *after* (*a*) Firth of Forth (tube only) *add* (*b–e*) Falmouth, Scarborough, and other parts of English coast, *Mrs. Robinson's Collection*; (*f*) Jersey, *Cuming's Collection*; (*g*) Falmouth, *W. P. Cocks*; (*h*) No locality=Sabella chrysodon, *Montagu*; (*i*) Ilfracombe, *Dr. J. E. Gray* (all these *tubes* only).

Page 237, Terebella nebulosa, *after* (*c*) Berwick Bay, *Dr. Johnston, add* (*d–g*) Polperro, Cornwall, *Laughrin.*

Page 238, Terebella constrictor, *for* (*c*) No locality *read* Falmouth, *W. P. Cocks, and then add* (*d*, *e*) Polperro, Cornwall, *Laughrin.*

Page 240, Terebella textrix, *after Desc. add* (*a*) Polperro, Cornwall, *Laughrin.*

Page 242, Venusia punctata, *after* (*h*) A case overgrown with *Sertulariæ*, &c., *add* (*i*) Polperro, Cornwall, *Laughrin.*

Page 243, Terebellides Strœmii, *after Desc. add* (*a*) Loch Long, Firth of Clyde, *D. Robertson.*

Page 245, Pectinaria belgica, *after* (*a*) South Devon, *G. Montagu, add* (*b*) Firth of Forth, *Mus. Leach*; (*c*) Berwick Bay, *Dr. Johnston*; (*d*) English coast (tubes only), *Mrs. Robinson*; (*e*) Cumbrae, Firth of Clyde (tubes only), *D. Robertson.*

Page 246, Pectinaria granulata, *after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b*) Cumbrae, Firth of Clyde (tube only), *D. Robertson.*

Page 250, Sabellaria anglica, *after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b*) Polperro, Cornwall, *Laughrin*; (*c*) Lucc Bay, Firth of

Clyde, *D. Robertson*; (*d*) Luce Bay, Firth of Clyde (dry tubes belonging to above specimens of animals), *D. Robertson*; (*e–g*) Ilfracombe and coast of England (tubes only), *Mrs. Robinson*; (*h*) Ilfracombe (tubes), *Dr. J. E. Gray*; (*i*) Granton, Firth of Forth (tubes only), *Dr. W. Baird*; (*j*) Falmouth, *W. P. Cocks*.

Page 251, Sabellaria lumbricalis, *after* (*b*) Berwick Bay, *Dr. Johnston, add* (*c*) Polperro, Cornwall, *Laughrin*.

Page 253, Arippasa infundibulum, *for* (*d*) No locality *read* Falmouth, *W. P. Cocks*; *and after that add* (*e*) Cumbrae, Firth of Clyde, *D. Robertson*. (This animal seems to have inhabited a sandy tube; and as it is very short, and perhaps not quite complete at the posterior extremity, it may either be a young, not quite developed individual, or possibly a new species. Only one specimen has as yet occurred, and it is not safe to decide upon this point till others have been procured.)

Page 259, Sabella penicillus, *after* (*c*) South coast of Devon, *Mus. Leach, add* (*d*) The Nore, *J. Henslow*; (*e*) Polperro, Cornwall, *Laughrin*; (*f*) Cumbrae, Firth of Clyde (very fine), *D. Robertson*; (*g*) Falmouth (dry tubes only), *W. P. Cocks*.

Page 260, Sabella vesiculosa, *after* (*a*) South Devon, *G. Montagu, add* (*b*) Berwick Bay, *Dr. Johnston*; (*c*) Guernsey, *Mrs. Mauger*.

Page 261, Sabella bombyx, *after* (*b*) Aberystwith, *J. Henslow, add* (*c–e*) Polperro, Cornwall, *Laughrin*; (*f*) ? Coast of Britain, *Zool. Soc. Collection*.

Page 267, Protula protensa, *after* (*c*) Loch Torridon, *R. M'Andrew, add* (*d*) Polperro, Cornwall, *Laughrin*; (*e–g*) No locality; (*h*) Falmouth (tubes only), *W. P. Cocks*; (*i*) Cumbrae, Firth of Clyde (animal and tube), *D. Robertson*.

Page 270, Serpula vermicularis, *after* (*e*) Berwick Bay, *Dr. Johnston, add* (*f–j*) Polperro, Cornwall (animals and tubes), *Laughrin*; (*k*) Falmouth (tubes only), *W. P. Cocks*; (*l*) Coast of Northumberland (tube only); (*m*) Loch Fyne (tube only); (*n, o*) Coast of England (tubes only), *Mrs. Robinson*.

Page 270, Serpula intricata, *after description of species add* Plate XX. fig. 5 (operculum).

Page 270, Serpula (Eupomatus) reversa, *after specific description add* Plate XX. figs. 6, 7 (operculum); *and* Page 271, *after* (*a*) Aberystwith, *J. Henslow, add* (*b*) Berwick Bay, *Dr. Johnston*; (*c*) Polperro, Cornwall, *Laughrin*; (*d*) Bantry Bay (tubes only); (*e*) Scarborough (tubes); (*f*) British coast (tubes on a dead *Cardium*-shell).

Page 271, Serpula Berkeleii, *after specific description add* Plate XX. fig. 4 (operculum); *and after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b*) Falmouth, *W. P. Cocks*; (*c*) Falmouth (tubes), *W. P. Cocks*.

Page 271, Serpula (Vermilia) conica, *after specific description add* Plate XX. fig. 1 (operculum); *and* Page 272, *after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b–d*) Polperro, Cornwall, *Laughrin*; (*e*) Coast of Northumberland (tubes); (*f*) Bantry Bay (tubes); (*g*) Scarborough (tubes only).

Page 272, Serpula (Pomatoceros) armata, *after specific description add* Plate XX. fig. 2 (operculum); *and after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b*) Hastings; (*c, d*) Polperro, Cornwall, *Laughrin*; (*e–i*) Falmouth (tubes only), *W. P. Cocks*; (*j*) Coast of Northumberland (tubes).

Page 272, Serpula (Pomatoceros) Dysteri, *after specific description add* Plate XX. fig. 3 (operculum); *and* Page 273, *after* (*a*) Berwick Bay, *Dr. Johnston, add* (*b*? *c*?) Polperro, Cornwall, *Laughrin.*

Page 273, *after* Sp. 7. Serpula Dysteri, *add*

Sp. 8. **Serpula (Placostegus) tricuspidata.**

Serpula tricuspidata, *Sowerby, Tankerville Cat. of Shells, Appendix* i. no. 24 (1825).
Serpula crystallina, *Scacchi, Catal. Conch. Reg. Neapol.* (1836).
Placostegus crystallinus, *Philippi, Wiegm. Archiv,* i. 192. t. 6. f. D (1844). *Grube, Famil. der Annelid.* p. 91.

Branchial filaments about 9 on each side; base of the operculum without a process; tube three-cornered, with 3 keels projecting acutely at the mouth, dorsal keel toothed.—*Grube.*

Hab. Coasts of Scotland and Ireland.

(*a*) Cork (tubes only, adhering to a dead *Pinna*).
(*b*) Shetland (tubes adhering to stones), *R. M'Andrew.*
(*c*) Shetland (tubes on stones), *Damon's Collection.*
(*d*) Isle of Skye (a single unattached tube).

Page 273, *for* Ditrupa subulata *read* Ditrupa arietina; *and to list of synonyms add*—

Dentalium arietinum, *Müller, Zool. Dan. Prodr.* (1776).
Dentalium subulatum, *Deshayes, Monogr. of Dental. in Mém. du Mus. d'Hist. Nat.* (1825). *Zool. Journ.* iv. 194 (1829).
Ditrupa subulata, *Berkeley, Zool. Journ.* v. (1835).
Serpula libera, *Sars, Beskrivelser &c.* p. 52. tab. 12. f. 32 *a-c* (1835). *Grube, Famil. der Annelid.* 91.
Placostegus (liberus), *Philippi, Wiegm. Archiv* (1844).
Ditrupa arietina, *Sars, Reise* (1849).

After Hab. add (*a*) Shetland (tubes and animals), *J. G. Jeffreys*; (*b*) Shetland (tubes only), *J. G. Jeffreys*; (*c*) Shetland (tubes only), *Rev. A. Merle Norman.*

Page 274, Filograna implexa, *after* (*a*) Devonshire *add* (*b*) Scarborough (mass of dry tubes); (*c*) Coast of Northumberland (dry tubes in a mass); (*d*) Falmouth (mass of dry tubes), *W. P. Cocks*; (*e*) British coast (dry tubes creeping singly, inside of a dead *Pecten*).

Page 274, *after* FILOGRANA, *and before* OTHONIA, *add*—

Genus 48*. **SPIRORBIS.**

Daudin, Rec. des Mém. de Mollusques (1800). *Lamarck, An. s. Vert.* v. (1818). *Fleming, Philos. of Zool.* (1822); *Nat. Hist. of Brit. Anim.* (1828); *Edinb. Encycl.* vii. 68. *Leach, Encycl. Brit. Suppl.* i. 452. *Schweigg. Handb. der Naturg.* 601. *Johnston, Ann. & Mag. Nat. Hist.* xvi. (1845). *Grube, Famil. der Annelid.*

Basal leaves of the branchiæ rolled in a circle or semicircle; one or two opercula, not united together when two; tubes generally isolated, entirely attached, twisted into a flat or nearly flat spiral.—*Grube.*

Sp. 1. **Spirorbis nautiloides.**

Serpula spirorbis, *Linn. Faun. Suec.* ed. 2. no. 2204; *Syst. Nat.* 1265. *Fabr. Faun. Grœnl.* 377. *Müll. Zool. Dan.* iii. 8. tab. 86. f. 1–6. *Da Costa, Brit. Conch.* 22. tab. 2. f. 11. *Mont. Test. Brit.* 498. *Pennant, Brit. Zool.* iv. 358. tab. 94. f. 1.

Spirorbis nautiloides, *Lamk. An. s. Vert.* 1st ed. v. 359 (1818), 2nd ed. v. 613 (1838). *Templeton, Loud. Mag. Nat. Hist.* ix. 233. *Griffith's Cuv. Règne An.* xiii. tab. 8. f. 6. *Grube, Famil. der Annelid.* 92.

Spirorbis communis, *Fleming, Edinb. Encycl.* vii. 68 (1820); *Edin. Phil. Journ.* xii. 245. *Johnston, Ann. & Mag. Nat. Hist.* xvi. (1845).

Operculum nearly shield-shaped, parabolical; branchial (filaments?) bearded, 3 on each side; tube opaque, wrinkled, with 3 turns, convex above, flat beneath, last turn not keeled.—*Grube.*

Hab. Shores of Great Britain.

(*a*) English coast (shells only, on sea-weed).
(*b*) Coast of England (shells, on sea-weed).
(*c*) Falmouth, *W. P. Cocks.*

Sp. 2. **Spirorbis spirillum.**

Serpula spirillum, *Linn. Faun. Suec.* ed. 2. 2203; *Syst. Nat.* 1264. *Fabr. Faun. Grœnl.* 376. *Pallas, Nov. Act. Petrop.* ii. 236. tab. 5. f. 21. *Mont. Test. Brit.* 499.

Spirorbis spirillum, *Lamk. An. s. Vert.* ed. 1. v. *Fleming, Edinb. Encycl.* vii. 68. *Johnston, Ann. & Mag. Nat. Hist.* xvi. *Grube, Famil. der Annelid.* 92.

Operculum of the form of a finger-nail; branchial filaments 4 on each side; tube transparent, with 3 turns, last turn not keeled.—*Grube.*

Hab. British coasts.

(*a*) English coast (shells alone, on sea-weed).
(*b*) Falmouth (shells, on sea-weed), *W. P. Cocks.*

Sp. 3. **Spirorbis granulatus.**

Serpula granulata, *Linn. Syst. Nat.* 1266. *Fabr. Faun. Grœnl.* 380. *Mont. Test. Brit.* 500. *Donovan, Nat. Hist. of Brit. Shells*, iii. f. 100. *Dillw. Recent Shells*, 1074. *Penn. Brit. Zool.* iv. 359.

Serpula sulcata, *Adams, Linn. Trans.* iii. 255.

Spirorbis granulatus, *Fleming, Edinb. Encycl.* vii. 68. *Brown's Illust.*

tab. 1. f. 47. *Johnston, Ann. & Mag. Nat. Hist.* xvi. 451. *Grube, Famil. der Annelid.* 93.

Operculum funnel-shaped (not furrowed and notched); branchial filaments bearded, 5 on each side; tube opaque, somewhat wrinkled transversely, with 2 deep longitudinal dorsal furrows and 2 turns, last turn not keeled.—*Grube.*

Hab. British coasts.

(*a*) Scarborough (dried shells only, on a piece of rock).
(*b–f*) Falmouth (dry shells, on a piece of rock).
(*g*) Falmouth (on a dead oyster-shell).

Of the following species, specimens of which are in the Collection of the British Museum, the animals have not been examined. The shells alone have been described.

Sp. 4. **Spirorbis corrugatus.**

Serpula corrugata, *Mont. Test. Brit.* 502. *Penn. Brit. Zool.* iv. 360. *Turt. Conch. Dict.* 151; *Brit. Faun.* 201. *Dillw. Recent Shells*, 1075.
Spirorbis corrugatus, *Fleming, Edinb. Encycl.* vii. 68. pl. 204. f. 13; *Edinb. Phil. Journ.* xii. 245. *Brown's Illust.* pl. 1. f. 46. *Johnston, Index to Brit. Annel. in Ann. & Mag. Nat. Hist.* xvi. 451.

(*a*, *b*) Scarborough (dry shells, on stone).
(*c*, *d*) Falmouth (dry shells, on stone), *W. P. Cocks.*

Sp. 5. **Spirorbis lucidus.**

Serpula lucida, *Mont. Test. Brit.* 506. *Laskey in Mem. Wern. Soc.* i. 412. *Brown, Mem. Wern. Soc.* ii. 534. *Turt. Brit. Faun.* 201. *Penn. Brit. Zool.* iv. 360. *Dillw. Recent Shells*, 1075. *Turt. Conch. Dict.* 151.
Serpula reflexa, *Adams, Linn. Trans.* v. t. 1. f. 31, 32.
Spirorbis lucidus, *Flem. Edinb. Encycl.* vii. 68. *Brown, Illust.* pl. 1. f. 56–60. *Johnston, Ann. & Mag. Nat. Hist.* xvi. 452.
Serpula sinistrorsa, *Mont. Test. Brit.* 504.
Heterodisca lucida, *Flem. Edinb. Phil. Journ.* xii. 247.

(*a*, *b*) English coast (dry shells, on *Sertularia*).
(*c*) Coast of Great Britain (dry shells, on *Sertularia*).

Sp. 6. **Spirorbis heterostrophus.**

Serpula heterostropha, *Mont. Test. Brit.* 503. *Turt. Brit. Faun.* 201; *Conch. Dict.* 151. *Dillw. Recent Shells*, 1075. *Penn. Brit. Zool.* iv. 359.
Spirorbis heterostrophus, *Flem. Edinb. Encycl.* vii. 68. pl. 205. f. 1. *Brown, Illust.* pl. 1. f. 55. *Johnston, Ann. & Mag. Nat. Hist.* xvi. 452.
Heterodisca heterostropha, *Flem. Edinb. Phil. Journ.* xii. 247.

(*a*) English coast (on a piece of rock).
(*b*, *c*) Falmouth (on rock), *W. P. Cocks.*
(*d*) Scarborough (on rock).

Sp. 7. **Spirorbis minutus.**

Serpula minuta, *Mont. Test. Brit.* 505. *Turt. Brit. Faun.* 200; *Conch. Dict.* 150. *Dillw. Recent Shells*, 1072. *Penn. Brit. Zool.* iv. 359.

Spirorbis minutus, *Flem. Edinb. Encycl.* vii. 68. *Johnston, Ann & Mag. Nat. Hist.* xvi. 452.
Heterodisca minuta, *Flem. Edinb. Phil. Journ.* xii. 247.

(*a*) Falmouth (on stones), *W. P. Cocks.*
(*b*) Scarborough (separate specimens).
(*c*) Milton (on a stone), *Mus. Montagu.*

In his "Index to the British Annelides," in the Annals and Magazine of Natural History, vol. xvi., 1845, Dr. Johnston has given a list of a good many other species which have been described by various naturalists. As specimens do not exist in the National Collection, we shall merely give here the species as mentioned in the work above quoted.

Sp. 8. **Spirorbis carinatus.**

Serpula carinata, *Mont. Test. Brit.* 502.
Spirorbis carinatus, *Flem. Edinb. Encycl.* vii. 68.

Sp. 9. **Spirorbis Montagui.**

Serpula, n. sp., *Mont. Test. Brit.* 502.
Spirorbis Montagui, *Flem. Edinb. Phil. Journ.* xii. 245.

Sp. 10. **Spirorbis incurvatus.**

Serpula incurvata, *Turt. Gmel.* iv. 609.
Spirorbis incurvatus, *Flem. Edinb. Phil. Journ.* xii. 245.

Sp. 11. **Spirorbis pervius.**

Vermiculum pervium, *Mont. Test. Brit.* 518.
Spirorbis pervius, *Flem. Edinb. Phil. Journ.* xii. 245.

Sp. 12. **Spirorbis retortus.**

Serpula retorta, *Turt. Gmel.* iv. 609.
Spirorbis retortus, *Flem. Edinb. Phil. Journ.* xii. 245.

Sp. 13. **Spirorbis annulus.**

Spirorbis annulus, *Brown, Illust.* pl. 1. f. 44.

Sp. 14. **Spirorbis heterocliticus.**

Spirorbis heterocliticus, *Brown, Illust.* pl. 1. f. 57.

Sp. 15. **Spirorbis striatulus.**

Spirorbis striatulus, *Brown, Illust.* pl. 1. f. 59.

Sp. 16. **Spirorbis conicus.**

Spirorbis conicus, *Flem. Edinb. Encycl.* vii. 68. pl. 205. f. 3.
Heterodisca conica, *Flem. Edinb. Phil. Journ.* xii. 247.

Sp. 17. **Spirorbis reversus.**

Serpula reversa, *Mont. Test. Brit.* 508.
Spirorbis reversus, *Flem. Edinb. Encycl.* vii. 69.
Heterodisca reversa, *Flem. Edinb. Phil. Journ.* xii. 248.

Page 279, Mæa mirabilis, *at end of description add* (*a*) Scotland, *Dr. Greville.*

Append. page 304, *for* Plate II. C. *read* Plate I.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1, *a*, *b*. *Astemma filiformis*. *a*. Nat. size. *b*. Portion magnified.

Fig. 2, *a*, *b*. *Convoluta paradoxa*, magnified. *b*. Showing the involute margin.

Fig. 3. *Planaria hirudo*, magnified.

Figs. 4–6. *Pontobdella littoralis*. 4. Nat. size. 5. Magnified. 6. An outline figure drawn from an individual which had the genital organs extruded.

Plate II. *a*.

Figs. 1, 1*. *Omatoplea gracilis*. 1. Nat. size. 1*. Anterior portion magnified.

Figs. 2, 2*, 2**, 3, 3*. *Omatoplea rosea*. 2. Nat. size, both figures. 2*. Anterior portion. 2**. Caudal extremity:—both magnified. 3. Var. *brunnea*, nat. size. 3*. Head magnified.

Fig. 4. *Tetrastemma varicolor*, nat. size.

Figs. 5, 5*. *Omatoplea melanocephala*. 5. Nat. size. 5*. Magnified.

Figs. 6, 6*. *Omatoplea pulchra*. 6. Nat. size. 6*. Anterior portion magnified.

Plate II. *b*.

Figs. 1, 1*, 1**. *Borlasia olivacea*. 1, 1, 1. Nat. size. 1*. Anterior and middle portions magnified. 1**. Embryo?

Figs. 2, 2*. *Borlasia octoculata*. 2. Nat. size. 2*. Anterior portion magnified.

Figs. 3, 3*. *Borlasia purpurea*. 3. Nat. size. 3*. Head, anterior portion, middle, and tail, magnified.

Figs. 4, 5. *Astemma rufifrons*. 4. Nat. size. 5. Portion of anterior extremity magnified.

Plate III.

Various kinds of bristles connected with the feet, &c., of Annelides (simple bristles), figs. 1–23:—magnified.

Fig. 1. A spine (*aciculus*); generally one or two occur in each fascicle of bristles in each foot. 2. A forcipate spinet. 3, 3*–5. Forked spinets. 6, 7. Setaceous bristles. 8, 9. Ventricose bristles. 10, 11, 13, 14. Lanceolate bristles. 15. ? A seta belonging to *Lepidonotus pellucidus*. 17–19. Tarsiform bristles from the superior and inferior branches of one of the feet of *Lepidonotus pharetratus*. 21–23. Spinous bristles.

Plate IV.

Various kinds of bristles connected with the feet, &c., of Annelides:—magnified.

Figs. 1–13. Compound bristles, peculiar to the Annelida rapacea. The compound bristles are bristles of which the shaft is broken into two halves by an imperfect sort of joint; the lower portion is the shaft, and the upper the terminal piece. Fig. 1 is a tarsiform compound bristle. Figs. 2, 6 & 12 are falcate compound bristles. Fig. 7 is an acicular compound bristle. Figs. 5 & 6. Two bristles of the ventral branch of *Lepidonotus clava*. Figs. 14–17 are hooklets of one of the feet (uncini); almost peculiar to the tubicolous Annelides, the Terebellidæ, Serpulidæ, &c.

Plate V.

Lepidonotus semisculptus.

Fig. 1. The animal magnified: the line by its side shows the natural size*. 2. The head magnified, under surface. 3. Spine? 7–11. Various bristles, magnified.

Plate VI.

Fig. 4 of Plate V. A scale of *Lepidonotus semisculptus*. Fig. 5 of Plate V. Section of a segment of the body of ditto. Fig. 6 of Plate V. One of the feet of ditto:—all magnified.

Figs. 1–5. *Pholoë eximia*. 1. Animal magnified. 2. A scale; one of the upper twelve. 3. One of the ventral bristles. 4. One of the jaws. 5. One of the dorsal bristles:—all magnified.

* Unfortunately, the specimen mentioned by Dr. Johnston is not in the Collection, and though the figure agrees in most respects with his description, it does not tally with it in the number of scales. He describes the animal as possessing 15 pairs, the figure represents 20. A specimen of a Lepidonotus lately received from Guernsey, and now in the Museum Collection, and which I consider as being *L. semisculptus*, has 20 pairs of scales, and therefore, perhaps, the number 15 may be a misprint not corrected by Dr. Johnston as the MS. went through the press.—W. B.

Plate VII.

Lepidonotus pellucidus.

Fig. 1. Animal magnified. 2. Head. 3. One of the jaws. 4. One of the scales. 5–9. Various bristles of the feet. 10. A peculiar bristle, some of which are usually met with in the dorsal bundle of setæ:—all magnified.

Plate VIII.

Fig. 1. *Lepidonotus squamatus*, nat. size. *a*. The jaws slightly enlarged. *b*. A scale. *c*. A spine. *d*. A bristle from the ventral branch of the foot:—all magnified (the latter not correct).

Fig. 2. *Lepidonotus cirratus*, nat. size. *a*. The head: ′ antennæ, ″ palpi, ‴ tentacular cirri. *c*. A scale. *d*. The proboscis laid open. *e*. A foot with a tentacular cirrus. *f*. A foot without the tentacular cirrus:—all somewhat magnified.

Figs. 3–9. *Lepidonotus impar*. 3. Nat. size. 4. The head uncovered and magnified. 5, 5*, 6. Scales. 7, 8. Two views of two feet: *b*, *b*, the tentacular cirrus. 9. Three bristles:—all magnified.

Plate IX.

Aphrodita aculeata.

Fig. 1. Nat. size. 2. The head uncovered. 3. The head detached and somewhat magnified. 4. Under view of the anterior portion of the body. 5. The orifice of the proboscis. 6. The proboscis laid open by a longitudinal section, enlarged. 7. A few of the penicillate filaments magnified. 8, 9. Two views of the feet. 10. Various bristles. 11. The spine:—both magnified.

Plate X.

Aphrodita borealis.

Fig. 1. Nat. size, dorsal aspect. 2. Ventral aspect. 3. The anterior part magnified, seen from above 4. The same from below. 5. The proboscis laid open. 6. An outline of a foot. 7. The ventral branch of a foot. 8. Two spines. 9. Bristles of the superior fascicle. 10. A filiform bristle. 11. A bristle from the ventral branch. 12. Bristles from the inferior fascicle of the dorsal branch. 13. A portion of the skin of the belly:—all magnified.

Plate XI.

Figs. 1–9. *Polynoë scolopendrina*. 1. Nat. size. 2. The head with its appendages highly magnified; the front scales have been

removed. 3. The proboscis laid open. 4. Section of a segment, showing the squamous feet; the scales having been raised and reverted. 5. A scale. 6. One of the cirrigerous feet. 7. A bristle of the dorsal brush. 8. The upper bristle of the ventral brush. 9. One of its under bristles :—all magnified.

Figs. *a–e*. Bristles of the feet of *Aphrodita hystrix*. *a*. A bristle from the ventral branch of foot. *b*. A squamigerous foot, showing the two bundles of bristles with which it is armed. *c*. A bristle of the innermost or dorsal brush belonging to the dorsal branch of foot. *d*. A barbed bristle from the outermost brush belonging to the dorsal branch of the same foot. *e*. The same bristle, with its sheath, within which the barb can be enclosed :—all magnified.

Plate XII.

Figs. 1–3. *Entobdella hippoglossi*. 1. Nat. size, dorsal aspect. 2. Ditto, ventral aspect. 3. Animal magnified.

Plate XIII.

Figs. 1–5. *Pholoë inornata*. 1. Nat. size. 2. Anterior portion of the body magnified. 3. Proboscis laid open. 4. Two of the dorsal scales. 5. A foot :—magnified.

Figs. 6–15. *Sigalion boa* (details, magnified). 6. Proboscis removed and laid open. 7. Head and anterior segments seen from above. 8. Head on the ventral aspect, to show the mouth and origin of the palpi. 9. A scale from near the middle of the body. 10. Side view of a foot. 11. A bristle from the dorsal ramus of the foot, unjointed, but finely serrulated on one side. 12. Another bristle from the same ramus, slenderer and quite smooth. 13. A bristle from the indentation of the foot between the dorsal and ventral rami. 14. A bristle of the ventral ramus. 15. Another bristle of the same, situated under the former, and consequently next the ground.

Plate XIV.

Figs. 1–6. *Sphærodorum peripatus*. 1. Nat. size. 2. Animal highly magnified. 3. Anterior portion of the body from below, to show the position of the mouth and proboscis. 4. A few segments from near the middle of the body. 5. A single foot and branchiæ, to show their structure. 6. Three of the branchial globes separate from the feet :—all magnified.

Figs. 7–14. *Spinther oniscoides*. 7. Nat. size. 8. The dorsal aspect viewed through a common magnifier. 9. A view of the ventral surface. 10. Two feet detached and viewed from the back. 11. A foot as seen from below. 12–14. Bristles :—all magnified.

Plate XIV. *a*.

Figs. 1–3. *Phyllodoce maculata*. 1. Nat. size. 2. Anterior portion of the body magnified. 3. Two segments of middle portion of body still more highly magnified, to show the foliaceous cirri.

Fig. 4. *Psamathe punctata*. Animal magnified. The line attached shows the natural length.

Fig. 5. *Ioida macrophthalma*. Animal magnified. The line attached shows the natural length.

Plate XV.

Fig. 1. *Nereis pelagica*, nat. size. 1 *a*. The head and proboscis magnified. *a*. Small subulate antennæ. *p*. Palpi. *p. r*. Jaws. *s*. First segment of body. *t*. Tentacular cirri. 1 *b*. A lateral view of a foot. 1 *c*. Two bristles:—magnified.

Fig. 2. The young? of *N. pelagica*.

Fig. 3. *Heteronereis margaritacea* (details, magnified). *a*. Head with proboscis extruded. *b*. One of the jaws separated. *c*. The foot of the 12th ring. *d*. A foot from near the middle of the body viewed laterally.

Fig. 4. A side view of a foot of *Nereilepas fucata* from about the middle of the body, magnified.

Plate XV. *a*.

Figs. 1, 2. *Syllis armillaris*. 1. Nat. size. 2. Animal magnified. 2, *h*. The head more highly magnified.

Figs. 3, 4. *Syllis prolifera*. 3. Nat. size. 4. Animal magnified. 4, *h*. Head and anterior segments. 4, *s*. Middle segments. 4, *t*. Posterior extremity and styles:—all magnified.

Plate XV. *b*.

Glycera capitata.

Fig. 1. Nat. size, and in a favourite position. 2. The same with the proboscis protruded. 3. Head. 4. Proboscis fully extruded. 5. Apex of proboscis viewed in front, to show the jaws. 6. Three views of a jaw detached. 7. Side view of a foot from near the middle of the body, slightly compressed. 8. A view of two feet from above. 9. A bristle. 10. The tail:—all magnified.

Plate XVI.

Figs. 1–6. *Phyllodoce lamelligera*. 1. Nat. size. 2. Head, and proboscis as this appears when half extruded. 3. Proboscis fully

protruded. 4. Two segments. 5. A lateral view of a foot, reversed. 6. The setigerous papilla with its bristles and spine:—all magnified.

Figs. 7–10. *Phyllodoce bilineata.* 7. Nat. size. 8. The head. 9. The middle segments. 10. Caudal extremity:—magnified.

Figs. 11–15. *Phyllodoce viridis.* 11. Nat. size. 12. Head and anterior segments. 13. Head and proboscis extruded. 14. Middle segments seen from below. 15. Caudal extremity:—magnified.

Plate XVI. *a.*

Gattiola spectabilis.

Fig. 1. Animal magnified. 2. Natural length. 3. Head, above. 4. Head, lateral view. 5. Mouth. 6. Foot, with cirrus and bundle of bristles. 7. Bristle:—magnified.

Plate XVII.

Figs. 1–8. *Nerine vulgaris.* 1. Nat. size. 2. Anterior portion enlarged. 3. View of a segment cut transversely. 4. The caudal extremity. 5. A branchial filament separate. 6. Another view of a branchia. 7. Bristles. 8. Oviform bodies:—magnified.

Figs. 9–13. *Nerine coniocephala.* 9. Nat. size, tail wanting. 10. Proboscis magnified. 11. Antenna highly magnified. 12. One half of a cross section of an anterior segment. 13. A similar view of a segment from near the middle: both magnified.

Plate XVIII.

Figs. 1–6. *Leucodore ciliatus.* 1. Nat. size. 2. Animal magnified. 3. An antenna more highly magnified. 4. The bristles of the fifth segment. 5. A branchial process separated to show the cilia. 6. A few of the oviform bodies which lie between the intestine and the skin:—all magnified.

Figs. 7–12. *Cirratulus borealis.* 7. Nat. size. 8. Head and anterior segments much magnified. 9. A view of the mouth magnified. 10. Transverse section of a segment from the posterior part of the body. 11. A side view of two segments from near the middle, showing the spines greatly magnified. 12. The tail much magnified.

Plate XIX.

Figs. 1–10. *Trophonia plumosa.* 1. Nat. size. 2. Anterior segments from above. 3. The same from below: magnified. 4. Three segments laid open by an incision through the ventral surface, and spread out. 5. A portion of the skin highly magnified. 6. One of the front bristles. 7. A bristle from the

dorsal brush of a segment from near the middle of the body. 8. Another bristle from the same. 9. A bristle from the ventral brush. 10. One of the small bristles associated with the preceding :—magnified.

Figs. 11–18. *Travisia Forbesii*. 11. Nat. size. 12. Animal magnified. 13. Cephalic segments. 14. Side view of a segment from near the middle. 15. View of a caudal segment on the dorsal aspect. 16. The same on the ventral aspect. 17. Anal segments. 18. A few bristles :—magnified.

Plate XX.

Opercula of different species of *Serpula*.

Fig. 1. Operculum of *Serpula conica* (see p. 347). 2. Operculum of *Serpula armata* (p. 347). 3. Operculum of *Serpula Dysteri* (p. 347). 4. Operculum of *Serpula Berkeleii* (p. 346). 5. Operculum of *Serpula intricata* (p. 346). 6, 7. Operculum of *Serpula reversa*, two views (p. 346).

INDEX.

Abranchia setigera. 55.
Achæthelmintha, 1.
aculeata (Aph.), 101 ; (Halith.), 102.
acuminata (Oph.), 215.
affinis (Plan.), 12 ; (Fabr.), 274.
agricola (Lumb.), 59.
alba (Plan.), 10, 12 ; (Omat.), 23 ; (Borlas.), 23; (Lin.), 27 ; (Glyc.), 186, 342.
albicans (Gord.), 23.
Albione, 39.
albus (Lin.), 27 ; (Gord.), 27.
algæ (Tetrast.), 20; (Plan.), 20.
alpina (Hirud.), 11.
Alveolaria, 251.
alveolaria (Sab.), 248.
alveolata (Sab.), 248, 250 ; (Amph.), 248; (Sabell.), 248 ; (Herm.), 248.
Ammotrypane, 215, 217.
Amphicora, 274.
Amphictene, 243.
Amphictenea, 243.
Amphinomæ, 95, 126.
Amphinomæa, 126.
Amphinomea, 126.
Amphinomenaceæ, 126.
amphisbæna (Lumb.), 59.
Amphitrite, 243, 253.
Amphitrites, 234.
Amytiaceæ, 96, 197.
Amytidea, 197.
anatomicus (Lumb.), 60, 330.
anceps (Malac.), 35 ; (Hirud.), 35.
Anevormi, 5.
angliæ (Borl.), 25.
anglica (Sabell.), 248 ; (Tubul.), 248.
anguis (Gord.), 28.
Anneleides, 81.
Annelida errantia, 81.
—— suctoria, 36.
—— terricola, 55.
Annelides, 2, 76, 81.
—— Hirudineæ, 36.
—— Lumbricinæ, 55.
—— Nereideæ, 81.
annularis (Lumb.), 62.
annulata (Meck.), 27, 296; (Valen.), 28 ; (Aph.), 118, 281.
Annulata appendiculata Polychaeta, 76.
annulatus (Gord.), 27 ; (Lin.), 28.
annulicornis (Eun.), 131 ; (Leod.), 131.
annulus (Spir.), 350.
antennata (Eun.), 132 ; (Leod.), 132 ; (Ner.), 132.
Aonis, 343.
Aphrodita, 97, 100.
Aphroditaceæ, 95, 97.
Aphroditæ, 97.
Aphroditæa, 97.
Aphroditea, 97.
Apoda, 1.
Apomatus, 264.
Aporocephala, 2, 5.
Aprocta, 5.
arcta (Aph.), 125.
arctica (Het.), 163; (Ner.), 163.
arenarius (Clit.), 67, 334 ; (Lumb.), 67.
arenicoida (Clym.), 233.
Arenicola, 229.
Arenicolidæ, 214, 226.
arenosa (Tubip.), 248 ; (Alv.), 251.
areolata (Pont.), 41.
arethusa (Plan.), 11.
Ariciadæ, 96, 198.
Ariciæ, 198.
Ariciea, 198.
aries (Ner.), 200.
arietina (Dit.), 347.
arietinum (Dent.), 347.
Arippasa, 252.
armata (Serp.), 272 ; (Vermil.), 272.
armatum (Prost.), 18.
armillaris (Syll.), 191 ; (Ner.), 191.
arundo (Serp.), 264.
Ascarid or Planarian worm (Styl.), 25.
Ascaris, 20.
Astemma, 4, 19, 288.
atomata (Lept.), 6 ; (Plan.), 6.
aulogaster (Amm.), 215 ; (Oph.), 215.
Aulostoma, 37, 46.
Aulostomum, 46.
auricoma (Amph.), 244, 245 ; (Amphict.), 244 ; (Pect.), 245.
Autolytus, 192.

Bdellidea, 2, 36, 38.
Bdellomorpha, 2, 30, 31, 34, 299.
beattiei (Serp.), 338.
Bebryce, 207.
belgica (Pect.), 243, 246 ; (Sab.), 243 ; (Ner.), 243.
berkeleii (Serp.), 271.
bilineata (Ner.), 159 ; (Phyll.), 177.
bioculata (Plan.), 21 ; (Glossiph.), 52, 316 ; (Hirud.), 52 ; (Erpob.), 52 ; (Cleps.), 52 ; (Glossob.), 52 ; (Glossop.), 52.
Black-headed red worm, 60.
Black-headed small-tailed worm, 60.
boa (Sig.), 124.
boeckii (Aren.), 232.
bombyx (Sab.), 261 ; (Amph.), 261.
borealis (Aph.), 104 ; (Euph.), 127 ; (Cirr.), 210 ; (Clym.), 233.
Borlasia, 4, 21, 25, 284.
borlasii (Nem.), 25 ; (Meck.), 25.
Bramble-worm, 62.
Branchellidæ, 37, 38.
Branchellion, 37, 38.

branchialis (Aren.), 231.
Branchiarius, 282.
Branchiobdella, 38.
Brandling, 62.
brevimana (Ner.), 147.
brunnea (Polyc.), 9; (Fasc.), 9; (Plan.), 9.
buccinicola (Ner.), 159.
bullata (Ner.), 208.
Button-worm, 60.

cæca (Ner.), 167; (Neph.), 167.
cærulea (Ner.), 154.
calcarea (Spio), 282.
caliginosus (Lumb.), 60.
caligorum (Udon.), 34, 299.
campanulata (Pont.), 42, 304; (Hirud.), 42; (Amph.), 269.
Campontia, 276.
Campontiadæ, 276.
candidum (Prost.), 23.
capitata (Glyc.), 186.
capitatus (Lumb.), 68.
Capsala, 30, 33.
Capsalidæ, 32, 299.
carbonaria (Aren.), 229.
carinata (Serp.), 350.
carinatus (Spir.), 350.
Carinella, 27.
carnea (Sab.), 261.
Castalia, 181.
Catharina (Johnst.), 73.
celata (Spio), 205.
Cephalobranchia, 214.
cephalota (Hir.), 339.
Cephalotrix, 4, 19.
Cercaria, 18.
Cerebratulus, 284.
Cestoidina, 18.
Chætelmintha, 1.
Chætogaster, 56, 71.
Chætopodes, 2, 76.
Chætopteridæ, 343.
Chætopterus, 343.
Chequered Leech, 50.
Chloræma, 223.
Chloræmea, 222.
chloroticus (Lumb.), 60.
chrysodon (Sab.), 235.
ciliata (Valla), 68, 334; (Neph.), 167.
ciliatum (Leuc.), 205.
ciliatus (Lumb.), 68; (Leuc.), 205.
circulans (Glossiph.), 53; (Hirud.), 53.
cirrata (Aph.), 114, 118; (Pol.), 114; (Lep.), 114; (Tereb.), 236; (Sab.), 236.
Cirratulus, 209.
cirratulus (Lumb.), 201.
cirratus (Lep.), 114; (Lumb.), 210.
cirrhata (Tereb.), 236.
Cirrhatula, 209.
Cistena, 243.
clava (Lep.), 111; (Aph.), 111; (Hal.), 111; (Neph.), 167.
clavatus (Lep.), 111.
clavigera (Phyll.), 178.
Clepsine, 50.
Clepsinea, 37, 49.
Clitellio, 56, 66.
Clymene, 233.
Clymenoida, 233.
coccinea (Caps.), 33; (Phyll.), 33.
coccineum (Trist.), 33.
coluber (Vermic.), 23.
Common Leech, 48.
Common Lug, 230.
communis (Lumb.), 60; (Spir.), 348.
complanata (Hirud.), 51; (Erpob.), 52; (Cleps.), 52; (Glossob.), 52; (Glossop.), 52.
complexa (Serp.), 274.
compressa (Sab.), 138.
concharum (Dod.), 212; (Cirr.), 212.
conchilega (Tereb.), 235, 241; (Ner.), 235, 243; (Sab.), 241.
conchylega (North.), 138; (On.), 138.
conica (Serp.), 271; (Vermil.), 271; (Heterod.), 350.
conicus (Spir.), 350.
coniocephala (Ner.), 201; (Spio), 201.
constrictor (Tereb.), 238.
contorta (Ner.), 202.
contortuplicata (Serp.), 269.
Convoluta, 3, 16.
convoluta (Plan.), 16.
cordifolia (Phyll.), 180.
corniculata (Lept.), 6.
cornuta(Euryl.),7; (Plan.), 7, 10; (Syll.), 192.
corrugata (Serp.), 349.
corrugatus (Spir.), 349.
crassa (Eum.), 221.
crassissima (Sabell.), 250; (Herm.), 251.
crassus (Verm.), 222.
crenata (Hirud.), 52; (Erpob.), 52.
crenaticornis (Spio), 204, 282.
cristata (Euryl.), 8.
cristatus (Proc.), 8.
Cryptocœla, 5, 30, 31.
crystallina (Serp.), 347.
crystallinus (Plac.), 347.
cuneus (Planar.), 17.
curta (Sab.), 263.
cyprinæ (Monost.), 35.

Dalyellia, 4, 13.
Dalyellidæ, 3, 13.
dalyellii (Euryl.), 7.
Dendrocœla, 8.
Dero, 69.
Derostoma, 4, 14.
Derris, 282.
Dew-worm, 59.
diaphana (Naïs), 71; (Chæt.), 71.
Diclidophora, 31.
digitata(Proto),69;(Naïs), 69; (Dero), 69.
digitatum (Oct.), 31.
Diplotis, 205, 282.
Discophora, 36.
Distigma, 14.
Ditrupa, 273.
diversicolor (Ner.), 152.
Dodecaceria, 212.
Dorsibranchia, 81.
Dorsibranchiata, 81.
dorvilliana (Aren.), 231.
dubia (Glyc.), 185.
Duggs, 62.
dumerilii (Ner.), 156.
dysteri (Prot.), 267; (Serp.), 272.

eachana (Glossiph.), 54.
Earth-worms, 57, 58, 59.
ecaudata (Aren.), 231.
edinensis (Plan.), 11; (Dalyell.), 11.
edwardsii (Chlor.), 223; (Siph.), 223.
Eight-eyed Leech, 44.
elegans (Nitsch.), 33, 299.
ellipsis (Lept.), 7; (Plan.), 7; (Phyll.), 180; (Ner.), 180.
elliptica (Aph.), 102.
elongata (Caps.), 33; (Nitsch.), 34.
Enchytræus, 56, 63, 332.
Enterion, 57.
Entobdella, 30, 32.

Ephesia, 206.
Epibdella, 32.
Erpobdella, 44.
Eruca marina, 101.
eruciformis (Oph.), 217; (Camp.), 276.
Eulalia, 178.
Eumenia, 221.
Eumolphe, 107.
Eunicæ, 95, 129.
Eunicæa, 129.
Eunice, 130, 131.
Eunicea, 129.
Euniceæ, 129.
Euniciadæ, 129.
Eunicidæ, 129.
Euphrosina, 126.
Euphrosine, 126.
Euphrosinidæ, 126.
Euphrosyna, 127.
Euphrosyne, 126.
Eupomatus, 271.
Eurylepta, 3, 7.
exigua (Dalyell.), 14; (Plan.), 14.
eximia (Phol.), 122.
extinctorium (Patella), 271.

Fabricia, 274.
fabricia (Tubul.), 274.
fabricii (Oth.), 274.
falcata (Plan.), 13.
fallax (Polyc.), 6.
fasciata (Leod.), 133.
fasciatus (Styl.), 24, 293; (Gord.), 24; (Lin.), 26, 296.
Fasciola, 6, 9, 10, 11, 13, 15.
felina (Polyc.), 10; (Plan.), 10.
festivus (Lumb.), 59.
figulus (Tereb.), 238.
filicornis (Spio), 202; (Ner.), 203.
filiformis (Ast.), 19; (Plan.), 19; (Borlas.), 19; (Nais), 71.
Filograna, 273.
filograna (Serp.), 274; (Filip.), 274.
fimbriata (Ner.), 155.
flaccida (Plan.), 29; (Borl.), 29.
flava (Glossiph.), 53, 317; (Hirud.), 53.
flavescens (Cirr.), 210.
flexilis (Lept.), 6; (Plan.), 6.
floccosus (Lep.), 119.
floscula (Amph.), 252.
flustra (Typh.), 16; (Plan.), 16; (Ceph.), 20, 289; (Ascar.), 20.
fodinæ (Plan.), 14.
fœcunda (Typh.), 15; (Plan.), 16.
fœtidus (Lumb.), 62, 331.
foliata (Ner.), 201.
foliosa (Pol.), 118; (Euph.), 126; (Nereis), 175; (Nereine), 201.
folium (Planoc.), 8; (Styl.), 8.
forbesii (Trav.), 220.
fragilis (Styl.), 24, 293; (Gord.), 24, 28; (Serp.), 28.
Fresh-water Polypus, 64.
fucata (Nereilep.), 158; (Lyc.), 159; (Ner.), 159.
fucicola (Het.), 153.
fulgens (Ner.), 153.
fusca (Plan.), 9, 11; (Planoid.), 17; (Serp.), 28, 298; (Hæmops.), 48; (Hirud.), 48; (Psam.), 182.
fuscescens (Cirr.), 210.
fuscus (Gord.), 29.

Gattiola, 195.
Geobdella, 45.
geometra (Pisc.), 43; (Hirud.), 43; (Ichth.), 43.
gesserensis (Borl.), 21, 290; (Plan.), 22; (Notosp.), 22; (Gord.), 22; (Phyll.), 175.
gigantea (Eun.), 134; (Tereb.), 237.
Gilt-tail, 63.
Glossiphonia, 50, 312.
Glossobdella, 50.
Glossophonia, 37.
Glossopora, 50.
Glossoporidæ, 37, 49.
Glycera, 184.
Glyceraceæ, 96, 184.
Glyceracæ, 184.
Glycerea, 184.
Goniada, 189.
goodsirii (Troph.), 224; (Pher.), 224.
gordianus (Lumb.), 63.
Gordius, 22, 23, 24, 25, 27, 28.
gracile (Polyst.), 23.
gracilis (Plan.), 12; (Gord.), 19; (Omat.), 22, 291; (Lin.), 26, 295; (Nem.), 23, 26; (Prost.), 23; (Meck.), 26; (Eph.), 206.
graminea (Plan.), 13; (Dalyell.), 13.
grandifolia (Het.), 163.
granifera (Glossiph.), 51.
granularis (Lep.), 109.
granulata (Sab.), 244, 245; (Pect.), 245, 246; (Serp.) 348.
granulatus (Spir.), 348.
Great-tailed Leech, 43.
griffithsii (Phyll.), 180.
groenlandica (Pect.), 246.
grossa (Malac.), 35, 301; (Hirud.), 35; (Phyll.), 35.
gulo (Aulost.), 46, 307.
Gymnocopa, 2, 73.
Gyratricinea, 13.

Hæmocharis, 42.
Hæmopsis, 37, 47, 309.
Halimede, 181.
Halithea, 100, 106.
hamatum (Trist.), 32.
harassii (Eun.), 132.
haustrum (Plan.), 16.
hebes (Plan.), 12.
helluo (Dalyell.), 13; (Fasc.), 13; (Plan.), 13; (Distig.), 14.
Helmintha, 1.
Heluo, 44.
herculeus (Lumb.), 59.
Hermella, 247.
Hermellacea, 247.
Hermellea, 247.
Hermione, 106.
Hesionea, 181.
heteroclita (Glossiph.), 52, 316; (Hirud.), 52.
heterocliticus (Spir.), 350.
Heterocrisia, 214.
Heterodisca, 271.
Heteronereis, 145, 161.
heterostropha (Serp.), 349; (Heterod.), 349.
heterostrophus (Spir.), 349.
Hippobdella, 47.
hippoglossi (Entob.), 32; (Hirud.), 32; (Phyll.), 32; (Epib.), 32.
hirsuta (Ner. (Neph.)), 188
hirsutus (Lumb.), 68.
Hirudina, 36.
Hirudinacea, 37, 38.
Hirudinea, 36.
Hirudinea albionea, 39.
Hirudinea planærina, 30.

Hirudines, 36.
Hirudinidæ, 37, 47.
Hirudo, 36, 37, 48, 309.
hirudo (Planar.), 17.
hispida (Aph.), 106.
hombergii (Neph.), 169, 173.
Horse Leech, 46.
hyalina (Hirud.), 52; (Glossob.), 52; (Cleps.), 52; (Dipl.), 205, 282.
hystrix (Aph.), 106; (Halith.), 106; (Herm.), 106.

Iatrobdella, 48.
Ichthyobdella, 42, 43.
idunæ (Sig.), 124.
imbecillis (Ner.), 156.
imbricata (Aph.), 114, 118; (Pol.), 114.
imbricatus (Lep.), 118.
impar (Lep.), 112; (Pol.), 112.
implexa (Filog.), 273.
incurvata (Serp.), 350.
incurvatus (Spir.), 350.
infundibulum (Arip.), 252; (Amph.), 252; (Sab.), 252.
inhærens (Oct.), 31.
inornata (Phol.), 121.
insignis (Chæt.), 342.
intestinum (Serp.), 264.
intricata (Serp.), 270; (Vermil.), 270.
Ioida, 196.
iricolor (Ner.), 280.

Johnstonella, 73.
johnstoni (Conv.), 16.

lactea (P'an.), 10; (Fasc.), 10; (Hirud.), 10.
lacteum (Dendroc.), 10.
lactiflorea (Plan.), 23; (Nem.), 23; (Prost.), 23.
lacustris (Styl.), 70; (Ner.), 70; (Naïs), 71.
lævis (Pont.), 41, 303; (Hirud.), 41.
lamarckii (Cirrh.), 209, 210.
lamelligera (Phyll.), 175; (Ner.), 175.
laminosa (Phyll.), 175; (Nereiph.), 175.
Leaf Nereis, 201.
Leech, 48.
Leodoce, 131.
Lepidonotus, 100, 107.
lepidota (Pol.), 114; (Aph.), 118.
Leptoplana, 3, 5.
Leucodore, 204.
Leucodorum, 204.
libera (Serp.), 347.
liberus (Plac.), 347.
limacina (Amm.), 217.
Limivora, 80, 214.
limnei (Chæt.), 71.
lineata (Glossiph.), 54; (Hirud.), 54; (Erpob.), 54; (Glossob.), 54; (Cleps.), 54; (Sæn.), 66; (Ner. (Neph.)), 167.
lineatus (Ceph.), 19, 289; (Vermic.), 19; (Lin.), 26, 295; (Lumb.), 66, 67.
Lineus, 4, 25.
Lininæ, 18.
littoralis (Pont.), 42, 304; (Naïs), 66; (Lumb.), 67, 68; (Ner.), 161; (Tereb.), 235.
Littoreles, 56.
lividus (Lumb.), 60.
lobulata (Het.), 161; (Lyc.), 161; (Ner.), 161.
Lob-worm, 59.
Lombricini, 55.
longirostra (Aph.), 109.
longisetosa (Neph.), 172.
longissima (Het.), 164; (Ner.), 164.
longissimus (Lin.), 25, 293; (Borl.), 25.
Lophiocephala, 223.
lucida (Serp.), 349; (Heterod.), 349.
lucidus (Spir.), 349.
Lug, 230.
lumbricalis (Clym.), 233; (Sabell.), 251; (Sab.), 251; (Alv.), 251.
Lumbricidæ, 55, 57, 318.
Lumbricillæ, 57.
Lumbricina, 55, 57.
Lumbrici terrestres vulgares, 58.
Lumbriconereis, 141.
Lumbricus, 55, 57, 323.
Lumbrinereis, 141.
Lumbrineris, 130, 141.
lutraria (Ner.), 254.
luna (Amph.), 263.
Lycidice, 130, 140.
Lycoridea, 143.
Lycoris, 145.

macrocephala (Plan.), 16.
macrophthalma (Ioid.), 197.
maculata (Plan.), 7; (Phyll.), 177; (Ner.), 177; (Gon.), 189; (Tereb.), 240.
maculosa (Ner.), 198, 280.
Mæa, 278.
Mæadæ, 278.
major (Hirud.), 48; (Lumb.), 58, 325.
Malacobdella, 34.
Malacobdellidæ, 34.
Maldania, 232.
Maldaniæ, 232.
mamillata (Oph.), 220.
marcella (Ner.), 202.
margarita (Ner.), 154, 280.
margaritacea (Eun.), 135; (Lyc.), 152, 154; (Ner.), 154; (Het.), 166; (Neph.), 167.
marginata (Gloss.), 339; (Hir.), 339; (Pisc.), 339; (Ich.), 339; (Cleps.), 339.
Maricolæ, 81.
marina (Hirud.), 40; (Pisc.), 42; (Ichth.), 42; (Aren.), 229.
marinus (Gord.), 25; (Lumb.), 229, 232.
Marsh-worm, 59.
maximus (Gord.), 25; (Lumb.), 59.
Meckelia, 4, 27.
Medicinal Leech, 49.
medicinalis (Hirud.), 48, 309; (Sanguis.), 49; (Iatrob.), 49.
Medusa (Cirr.), 210.
melanocephala (Omat.), 23, 292; (Nem.), 23; (Prost.), 23.
Meleseti (Ter.), 210.
Mesostoma, 4, 14.
Mesostomum, 14.
Millepeda marina belgica, 158.
minor (Lumb.), 59, 329.
minuta (Aph.), 118, 281; (Serp.), 349; (Heterod.), 349.
minutus (Lumb.), 68; (Spir.), 349.
mirabilis (Mæa), 278.
mitis (Glyc.), 185.
molæ (Trist.), 33.
mollis (Ner.), 280.
monilaris (Syll.), 191.
monoceros (Syll. ?), 194; (Ner.), 194.

Monocotylea, 30.
Monopus medusicola, 35.
Monostoma, 35.
montagui (Aren.), 231; (Spir.), 350.
mulleri (Phyll.), 178; (Pher.), 224; (Serp.), 270.
murenoides (Lin.), 26; (Ophioc.), 26.
muricata (Pont.), 39, 302; (Hirud.), 40; (Alb.), 40; (Flem.), 224.
Mus marinus, 102.
Myrianida, 196.
Myzocephala monocotyla, 36.

Naidea, 69.
Naides, 56, 69, 336.
Naidina, 56, 69.
Naïs, 56, 69, 71.
nautiloides (Spir.), 348.
nebulosa (Tereb.), 237.
Nemertæ, 18.
Nemertea, 18.
Nemertes, 21, 22, 25, 284.
Nemertina, 2, 18.
Nemertinea, 18.
Nemertinidæ, 18.
Nephelidæ, 37, 43.
Nephelis, 37, 44.
Nephthyaceæ, 96, 167.
Nephthydea, 167.
Nephthys, 167.
Nereidæ, 96, 143.
Nereidæa, 143.
Nereidea, 143.
Nereideæ, 143.
Nereides, 143.
Nereides vagæ, 81.
Nereidice, 140.
Nereidina, 81.
Nereidonta, 131.
Nereilepa, 158, 161.
Nereilepas, 158.
Nereiphylla, 175.
Nereis, 143, 145, 161.
Nereiscolecia, 198.
Nereisyllis, 190.
Nerine, 199.
ninetta (Lycid.), 140.
nigra (Polyc.), 9; (Fasc.), 9; (Plan.), 9; (Hirud.), 9; (Borl.), 25; (Lin.), 25; (Hæmops.), 46; (Pseudob.), 46.
nigrescens (Aulost.), 46.
nigripes (Glyc.), 188.
nitens (Aph.), 102.
Nitschia, 30, 33.
noctiluca (Ner.), 281.
nodosa (Aren.), 231.
Northia, 130, 136.
norvegica (Eun.), 131; (Ner.), 131.
norvegicus (Lumb.), 59.
norwegica (Leod.), 131; (Eun.), 131.
Notobranchia, 81.
Notospermus, 22.

obscurum (Tetrast.), 24.
ocellata (Palm.), 121.
octentaculata (Ner.), 280.
Octobothrium, 30, 31.
octoculata (Borl.),21,290; (Plan.), 21; (Nemert.), 21; (Neph.), 44, 305; (Hirud.), 44.
Octodactylus, 31.
Oerstedia, 284.
œstroides (Amm.), 220; (Trav.), 220.
olidus (Lumb.), 62.
Oligochæta, 55.
olivacea (Borl.), 21, 289; (Nem.), 21.
Omatoplea, 4, 22.
omilurus (Lumb.), 63.
Onchobothriidæ, 34.
onisciformis (Tom.), 73.
oniscoides (Spinth.), 127.
Onuphis, 136.
opalina (Leod.), 134.
Ophelia, 215.
Opheliacea, 214.
Opheliaceæ, 214.
Opheliadæ, 214.
Ophelina, 215.
Opistomum, 3, 15.
oscillatoria (Hir.), 339.
ostreæ (Ter.), 212.
ostrearia (Amph.), 248.
Othonia, 274.

pallasii (Cist.), 244.
palmata (Diclid.), 31.
palmatum (Oct.), 31.
Palmyra, 121.
paludosa (Styl.), 70.
paniculata (Plan.), 9.
paradoxa (Conv.), 16, 283; (Het.), 165; (Ner.), 165.
Paromocrisea, 226.
pavonina (Sab.), 254.
Peacock-red worm, 60.
pecten (Tereb.), 242.
Pectinaria, 243.
pectinata (Ner.), 244.
pectinatus (Eup.), 271.
pedunculata (Aph.), 109.
pelagica (Ner.), 148, 152.
pellucida(Lumb.? Clit.?), 68; (Pol.), 117.
pellucidus (Lep.), 117.
Penicillus, 264.
penicillus (Tubul.), 254; (Amph.), 254; (Sab.), 254, 261.
pennata (Ner.), 131.
perata (Glossiph.), 53.
percæ (Pisc.), 43, 305; (Ichth.), 43.
peripatus (Sphær.), 208; (Beb.), 208; (Poll.), 208.
pervium (Vermic.), 350.
pervius (Spir.), 350.
pharetratus (Lep.), 113.
phasma (Ner.), 75.
Pherusa, 223.
Pherusea, 222.
Pholoë, 100, 121.
phosphorescens (Ner.), 194.
phosphoreus (Lumb.), 63.
Phylline, 32.
Phyllinidæ, 30.
Phyllodoce, 175.
Phyllodocea, 173.
Phyllodocidæ, 96, 173.
Physalus, 101.
pinnata (Ner.), 131; (Leod.), 131.
pinnigera (Myr.), 196; (Ner.), 196, 281.
piscatorum (Aren.), 229.
Piscicola, 37, 42, 305.
Piscicolidæ, 37, 39.
piscium (Hirud.), 40, 43; (Pisc.), 43; (Hæmoch.), 43; (Ichth.), 43.
Placostegus, 273, 347.
plana (Aph.), 114.
Planaria, 3, 10.
Planariadæ, 3, 8.
Planariea, 3, 5.
Planocera, 3, 8.
Planoceridæ, 3, 5.
Planoides, 17.
planus (Lep.), 114.
plumosa (Troph.), 224; (Amph.), 224; (Flem.), 224.
plumosum (Siph.), 224.
Polia, 20, 284.
Pollicita, 207.
Polycelis, 3, 9.
Polycotylea, 30, 31.
Polynoë, 100, 107, 119.
Polypoda, 2.

Polystemma, 22.
Pontobdella, 37, 39.
prasina (Typh.), 16; (Plan.), 16.
proboscidea (Naïs), 70.
Proceros, 7.
prolifera (Syll.), 192; (Ner.), 192; (Nereis.), 192; (Autol.), 192.
Prosthiostomum, 5.
Prostoma, 13, 22.
protensa (Prot.), 264.
protensus (Psyg.), 264.
Proto, 56, 69.
Protula, 264.
Psamathe, 181.
Psammate, 181.
Pseudobdella, 46.
Psygmobranchus, 264.
pulchellus (Lumb.), 59.
pulchra (Omat.), 24, 292; (Nem.), 24; (Prost.), 24; (Phyll.), 178.
pulchrum (Polyst.), 24.
pulsatoria (Ner.), 158; (Lyc.), 158.
punctata (Plan.), 6; (Glossop.), 53; (Lep.), 109; (Leod.), 133; (Psam.), 182; (Ner.), 182, 280; (Cast.), 182; (Ven.), 241.
purpurea (Borl.), 21, 290; (Nem.), 21.
purpureus (Styl.), 24, 292; (Gord.), 24.
putor (Lumb.), 63.
putredinis (Lumb.), 63.
pygmæus (Lumb.), 59.

quadrangularis (Branch.), 282.
quadricornis (Spio), 204, 282.
quadrioculata (Plan.), 20; (Nem.), 20; (Prost.), 20; (Pol.), 20.
quadristriata (Serp.), 70.
Quarry Planaria, 14.

Ram's-horn Nereis, 200.
Rapacia, 80, 81.
Red-head, 59.
Red-worm, 59.
reflexa (Serp.), 349.
remex (Ner.), 175.
renalis (Het.), 163; (Ner.), 163.
retorta (Spir.), 350.
retortus (Spir.), 350.
reversa (Serp.), 270, 350; (Heter.), 271; (Heterod.), 350.
reversus (Spir.), 270, 350.
Rhabdocœla, 13, 34.
Rhynchocœla, 18.
Riband Gordius, 28.
riparius (Lumb.), 60.
rivalis (Lumb.), 64.
rivulorum (Tubif.), 64.
rosea (Omat.), 23, 291; (Fasc.), 23; (Plan.), 23; (Prost.), 23; (Ner.), 182; (Amph.), 263.
roseum (Polyst.), 23.
rostrata (Fasc.), 15; (Plan.), 15.
rostratum (Mesost.), 15; (Derost.), 15.
rouxii (Glyc.), 185.
rubens (Vermic.), 24.
rudolphiana (Caps.), 33.
rudolphianum (Trist.), 33.
rudolphii (Branch.), 38.
rufa (Lycid.), 141; (Ner.), 280.
rufescens (Lumb.), 68.
rufifrons (Ast.), 19, 288; (Borlas.), 19.

Sabella, 253, 254.
Sabellaria, 247.
Sabellariadæ, 247.
Sænuris, 56, 64.
Sand-lob or Lugg-worm, 230.
Sand-mason, 235.
sanguinea (Eun.), 134; (Ner.), 134; (Nereid.), 134; (Leod.), 134; (Derr.), 282.
sanguinolenta (Euryl.), 7.
sanguinolentus (Proc.), 8.
sanguisorba (Hirud.), 47; (Hæmops.), 49; (Hippob.), 48.
Sanguisuga, 48.
sanguisuga (Hirud.), 46, 47; (Hæmops.), 46, 47, 309; (Hippob.), 48.
sarsii (Ner.), 147.
savignii (Sab.), 261.
scabra (Aph.), 109; (Polyn.), 109.
Scoleides, 55.
Scoloces, 2, 55, 57.
Scolopendræ marinæ, 81, 101.
scolopendrina (Pol.), 119.
scotica (Naïs), 71, 336.
Sea Mouse, 102.
Sea Scolopendra, 102.
Sea-worm, 229.
Segg-worm, 60.
semisculptus (Lep.), 116.
semisquamosa (Pol.), 119.
Serpentaria, 4, 28.
serpentaria (Meck.), 28.
Serpentina, 56, 70.
serpentina (Opist.), 15; (Plan.), 15; (Naïs), 70.
Serpula, 268.
Serpulacea, 251.
Serpulæa, 268.
Serpulidæ, 251.
Serpulina, 214.
seticornis (Spio), 203, 205, 281; (Ner.), 203.
setosa (Glyc.), 342.
sexoculata (Glossiph.), 51, 315.
Sigalion, 100, 123.
signata (Het.), 341.
sinistrorsa (Serp.), 349.
Siphonostoma, 223.
Siphonostomaceæ, 222.
Siphonostomum, 223.
Small red Water-worms, 64.
Somatotoma, 69.
Sommerwormes, 64.
sorex (Ner.), 187.
sowerbyi (Cleps.), 53.
spallanzanii (Sab.), 262.
spectabilis (Gatt.), 195.
Sphærodorum, 207.
Spinifer, 24.
Spinther, 126.
spinulosa (Pont.), 40; (Sabell.), 251.
Spio, 202.
Spiral Nereis, 202.
spirillum (Spir.), 348; (Serp.), 348.
Spirorbis, 347.
spirorbis (Serp.), 348.
squamata (Aph.), 109, 114, 118; (Polyn.), 109; (Eumol.), 109, 111.
squamatus (Lep.), 109.
squamosa (Ner.), 124.
stagnalis (Plan.), 11; (Hirud.), 52; (Erpob.), 52; (Cleps.), 52.
stagni (Plan.), 16.
stellaris (Fabr.), 274; (Tubul.), 274.
striata (Borl.), 22, 291; (Nem.), 22.
striatulus (Spir.), 350.
strœmii (Terebell.), 242.
sturionis (Trist.), 34.
Stylaria, 56, 70.

Stylochus, 8.
Stylus, 4, 24.
subauriculata (Lept.), 6; (Plan.), 6.
subrotunda (Aph.), 102.
subtentaculata (Plan.), 11.
subulata (Dit.), 273, 347.
subulatum (Dent.), 273, 347.
subulicola (Ner.), 155.
subviridis (Troch.), 45.
sulcata (Serp.), 348.
Syllidæ, 96, 190.
Syllidea, 190.
Syllis, 190.
Syphostoma, 223.

tænia (Meck.), 28, 298; (Gord.), 28.
Telethusa, 226.
Telethusæ, 226.
tentaculata (Ter.), 209, 210; (Cirrh.), 209.
tentaculatus (Cirr.), 209.
Terebella, 234.
Terebellacea, 234.
Terebellæ, 234.
Terebellidæ, 234.
Terebellides, 242.
Terebellum, 243.
teres (Lumb.), 65; (Ner.), 187.
Teretularia, 4, 18, 284.
terrester (Lumb.), 59.
terrestris (Lumb.), 32, 58, 59.
Terricolæ, 57.
tessellata (Neph.), 44, 53; (Gloss.), 50, 312; (Hirud.), 50; (Ichth.), 50; (Pisc.), 339.
tessulata (Hirud.), 50; (Erpob.), 50; (Cleps.), 50.
tetraëdrus (Lumb.), 62.
Tetrastemma, 4, 20.
textrix (Tereb.), 239.
tigrina (Syll.), 195.
tinctoria (Aren.), 229.
Tomopteridæ, 73.
Tomopteridea, 73.
Tomopteris, 73.
torpedinis (Branchell.), 38; (Branchiob.), 38.
torva (Plan.), 11; (Fasc.), 11.
trapezoides (Lumb.), 59.
Travesia, 220.
Travisia, 219.
tremellaris (Lept.), 6; (Fasc.), 6; (Plan.), 6.
tricolor (Lumb.), 142; (Ner.), 142, 185.
tricornis (Patella), 272.
tricuspidata (Serp.), 347; (Plac.), 347.
trilineata (Carin.), 28; (Meck.), 28.
triquetra (Serp.), 269, 271, 272; (Vermil.), 269, 272.
Tristoma, 32, 33.
Trocheta, 37, 45.
Trochetia, 45.
Trophonia, 223.
Trout-worm, 60.
truncata (Plan.), 17.
tuberculata (Glossiph.), 52; (Glossop.), 52; (Tereb.), 239.
Tubicola, 214.
tubicola (North.), 136; (Nereis), 136; (Leod.), 136; (Nereid.), 136; (On.), 136; (Eun.), 136.
Tubicolæ, 214.
Tubifex, 64.
tubifex (Sæn.), 64, 332; (Lumb.), 64, 65.
tubiformis (Sab.), 243.
Tubularia, 248, 274.
tubularia (Serp.), 264, 269; (Sab.), 264.
Tubus vermicularis, 269.
Turbella, 14.
Turbellaria, 1, 2, 5, 283.
Typhloplana, 3, 15.

Udonella, 30, 34.
ulvæ (Plan.), 12.
uncinata (Siph.), 223.
unicornis (Glyc.), 187.
unipunctata (Turbella), 14.
unipunctatum (Derost.), 14.
unispira (Sab.), 262.

vagans (Sæn.), 65, 333.
valenciennæi (Malac.), 35, 301; (Xenist.), 35.
Valencinia, 284.
Valla, 56, 67.
varians (Aph.), 114.
varicolor (Tetrast.), 20, 289.
variegata (Plan.), 12; (Sæn.), 64, 65, 333; (Hir.), 339.
variegatum (Tetr.), 20, 289.
variegatus (Verm.), 20; (Lumb.), 65; (Nais), 65.
velox (Plan.), 15; Dalyell.), 15; (Aph.), 119.
ventilabrum (Amph.), 254.
Venusia, 241.
venusta (Hal.), 184.
venustula (Tereb.), 238.
Vermes terrestres majores, 58.
vermicularis (Ench.), 63, 332; (Lumb.), 63; (Chæt.), 71; (Nais), 71; (Serp.), 269, 270; (Vermil.), 269.
Vermiculus, 20, 23, 24.
Vermilia, 269, 270, 271, 272.
Vermis aureus, 102.
verrucata (Pont.), 40, 302; (Alb.), 40; (Glossiph.), 51, 314; (Cleps.), 51.
verrucosa (Hirud.), 40; (Ner.), 153.
verrucosus (Lep.), 109.
versicolor (Ner.), 152.
vesiculosa (Sab.), 259; (Amph.), 259.
viganensis (Plan.), 10.
violacea (Aph.), 114.
viridis (Hir.), 13; (Plan.), 13; (Styl.), 24, 292; (Gord.), 24, 27; (Lin.), 27, 296; (Vort.), 14; (Lumb.), 61; (Aph.), 118; (Lyc.), 152; (Ner.), 152, 178; (Phyll.), 178; (Nereiph.), 178; (Eul.), 178; (Spio), 201.
vitrina (Glossiph.), 53, 317; (Hirud.), 53.
vittata (Euryl.), 8; (Plan.), 8; (Hirud.), 42; (Aon.), 343.
volutacornis (Sab.), 262; (Amph.), 262.
vorax (Derost.), 14; (Plan.), 14; (Aulost.), 46; (Hirud.), 46.
vulgaris (Hirud.), 44; (Erpob.), 44, 50; (Neph.), 44; (Ner.), 200; (Spio), 200.

White Rag-worm, 167.
White worm, 167.

xanthurus (Lumb.), 63.
Xenistum, 34.

Yellow Leech, 53.
Yellow-tails, 63.

THE END.

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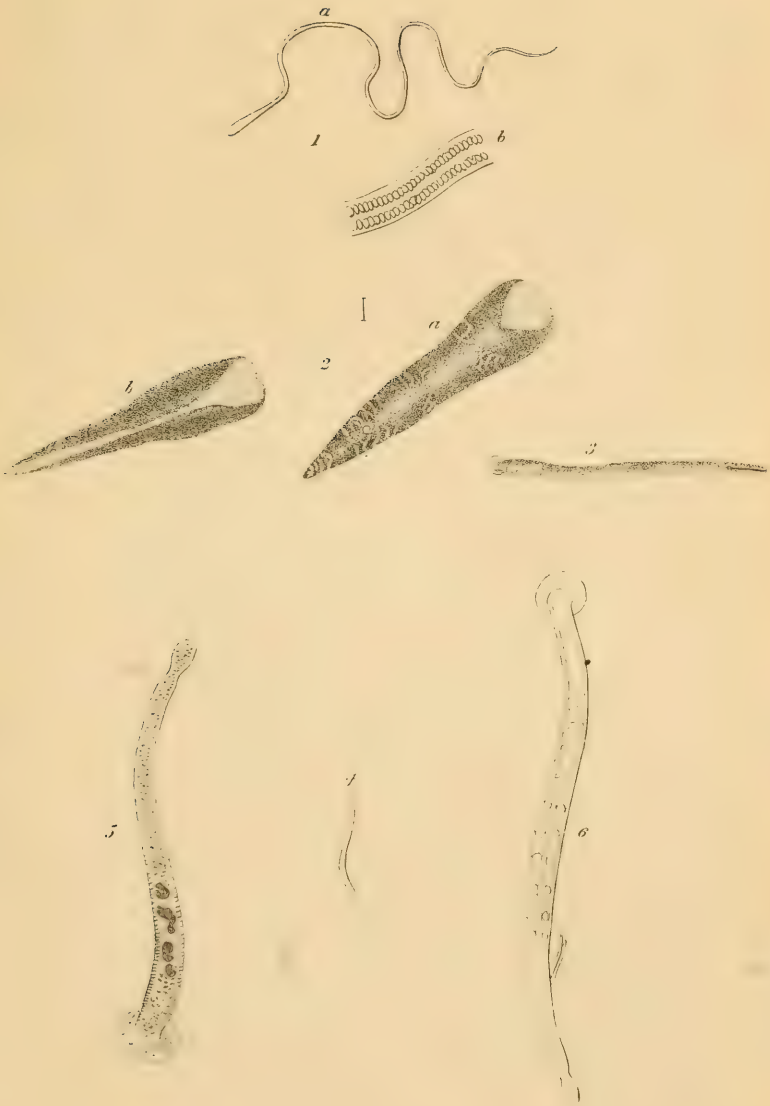
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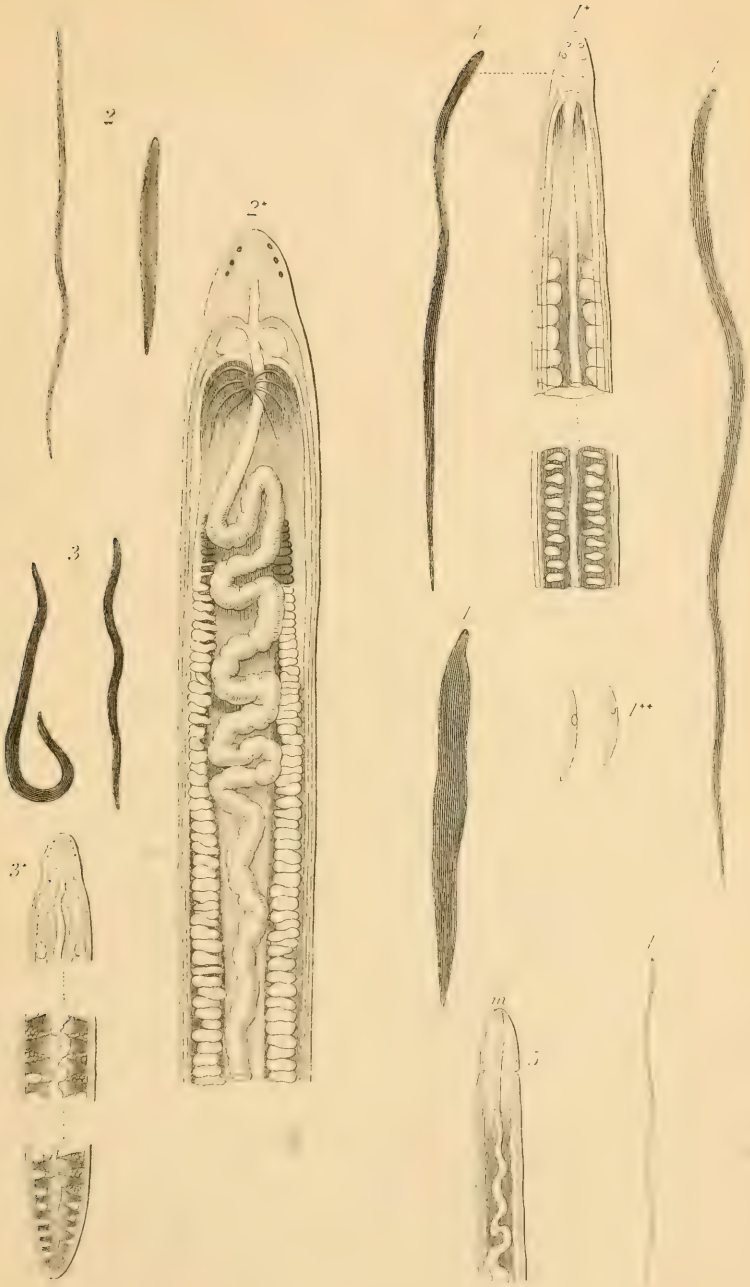
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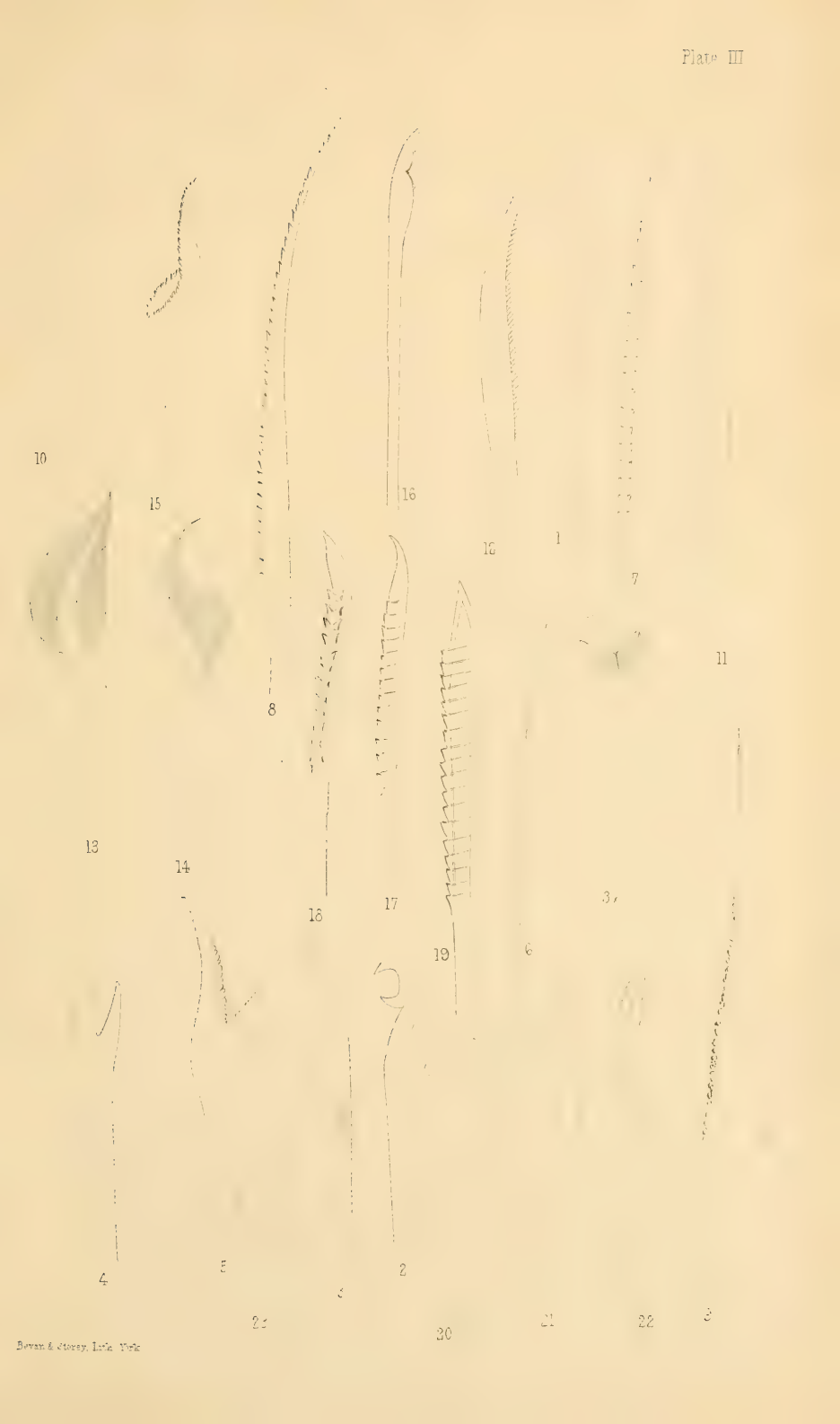

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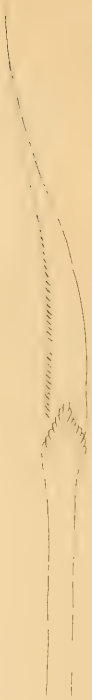
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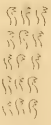
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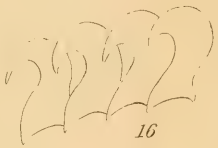
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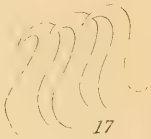
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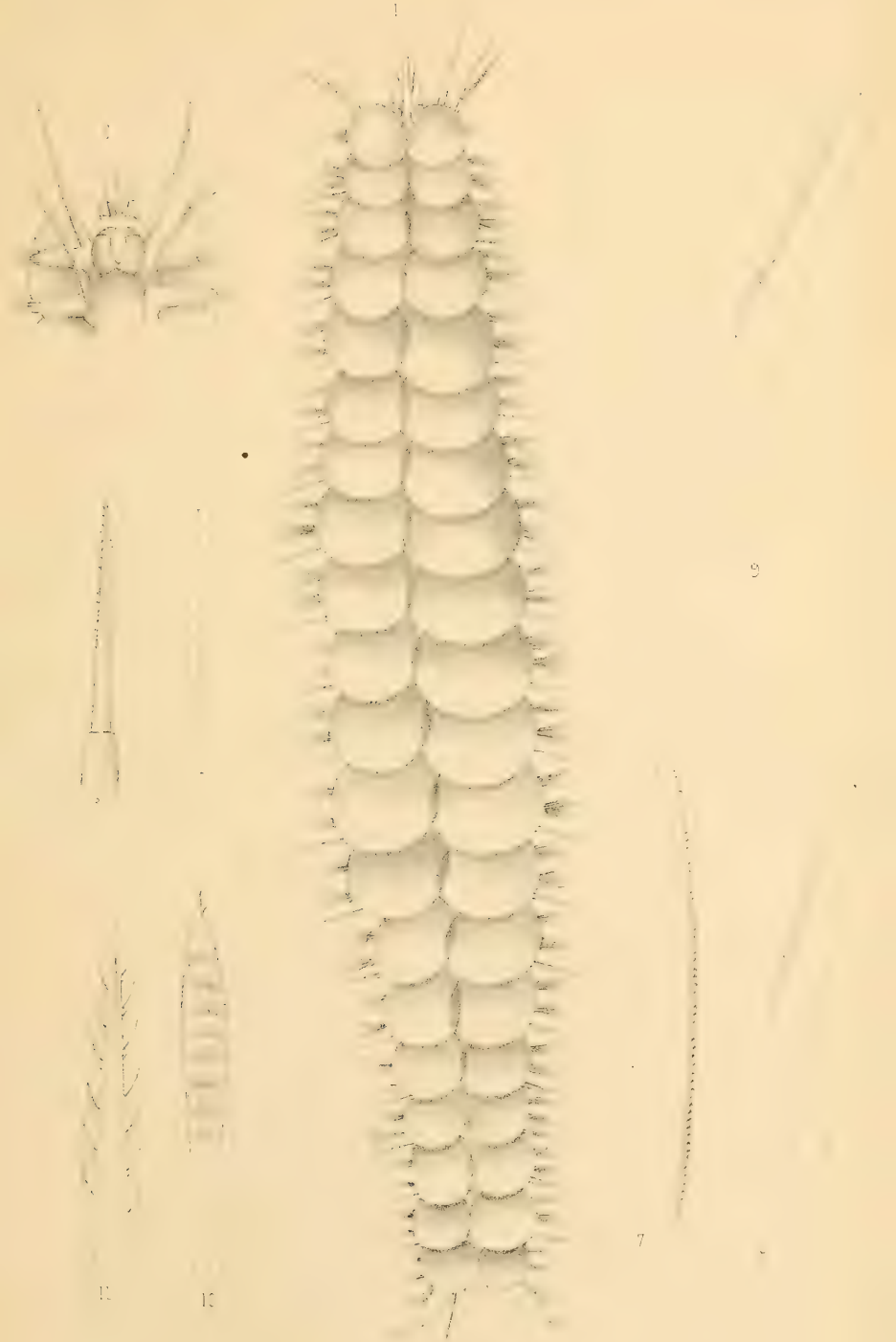
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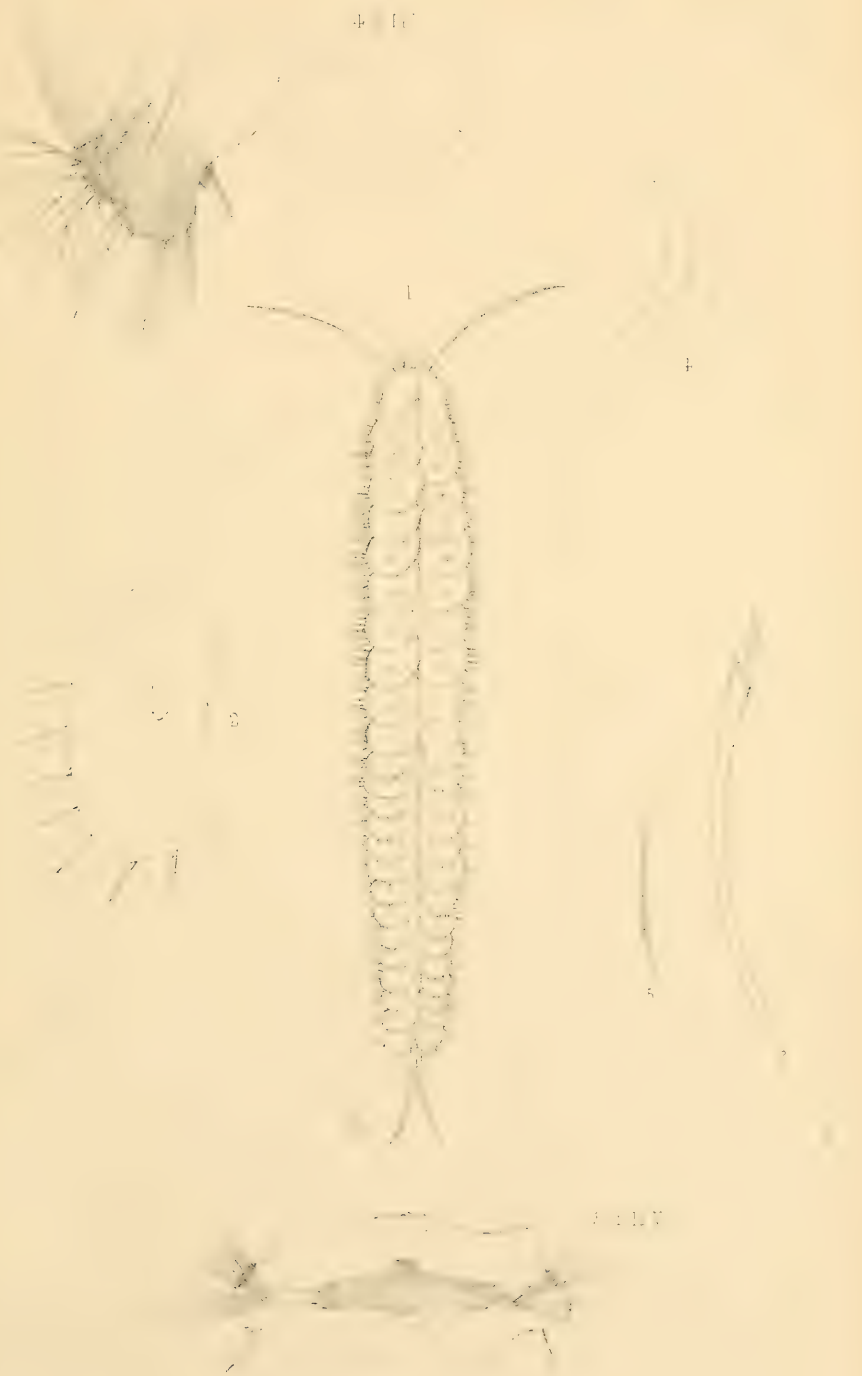

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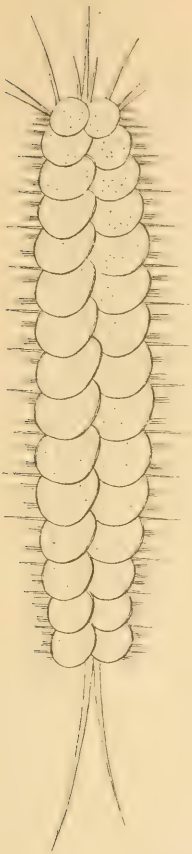
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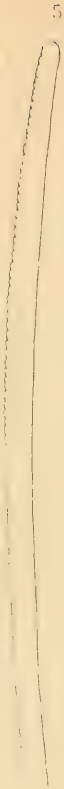
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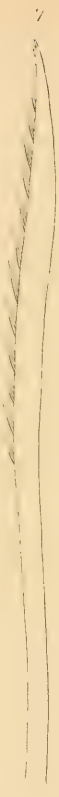
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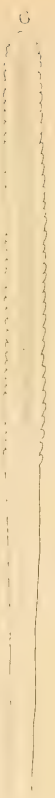
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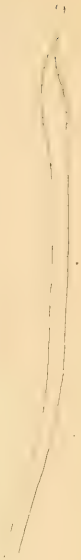
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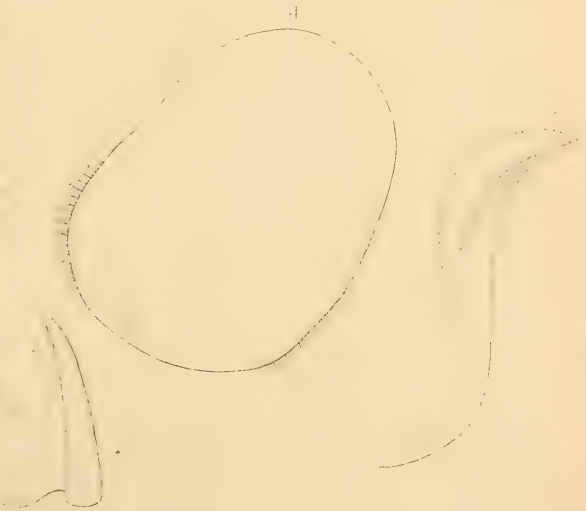
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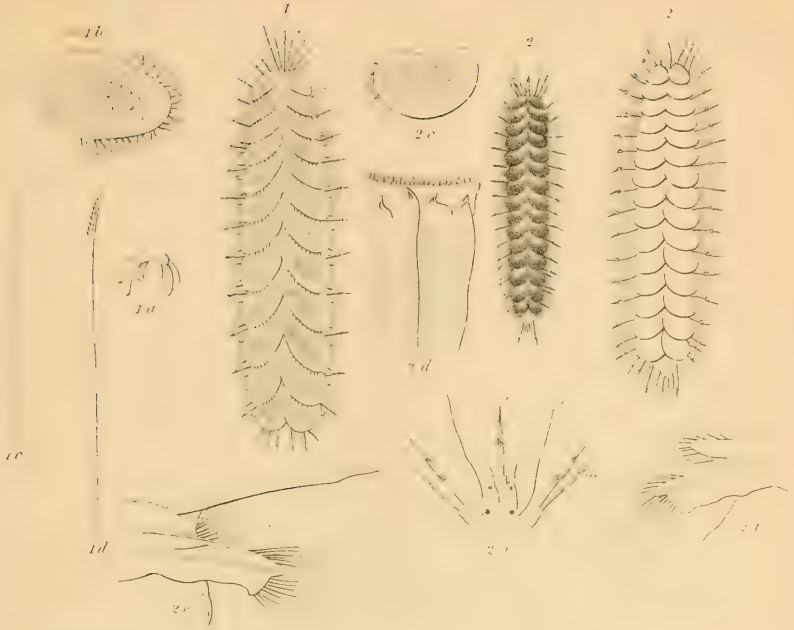

P. squamata. *P. cirrata.*

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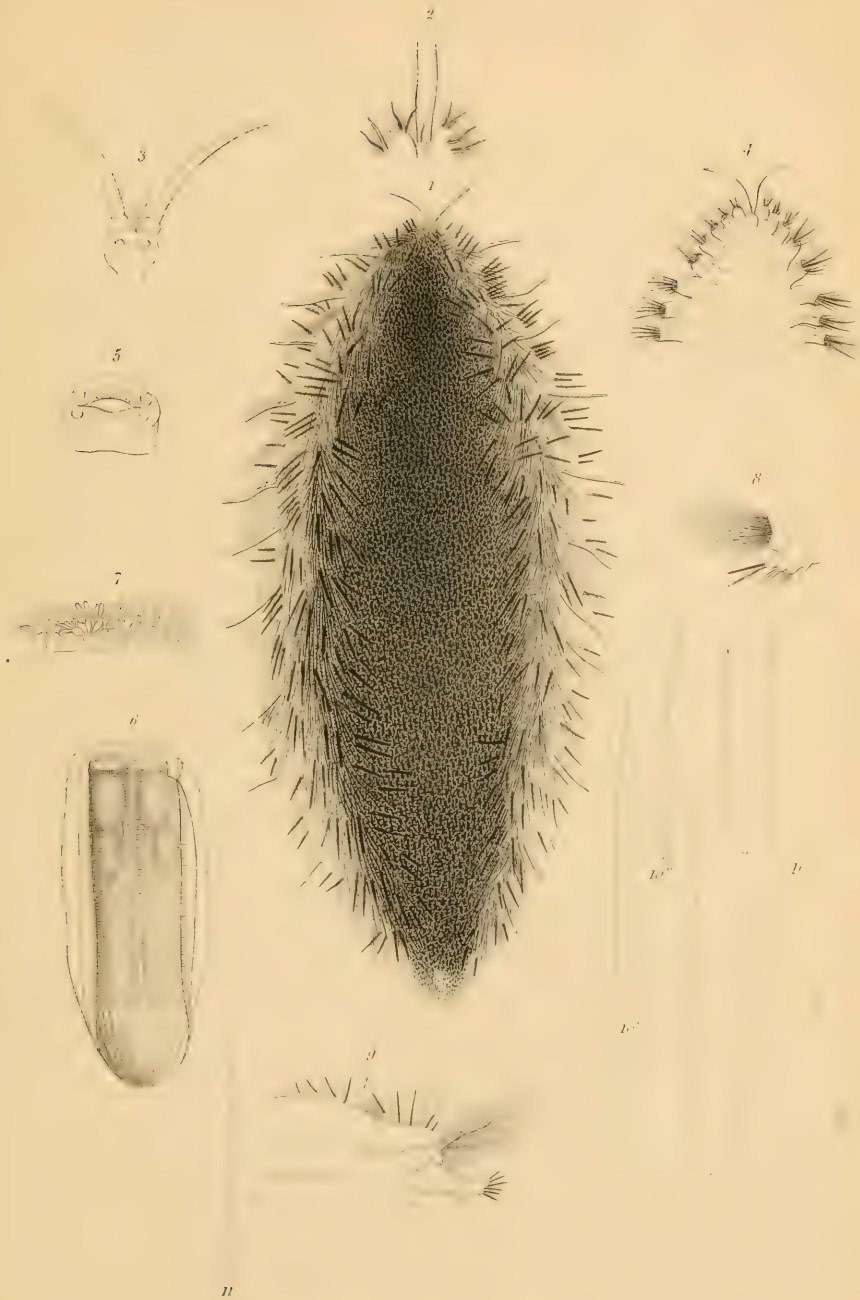

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C. Johnston, ad. nat. del.

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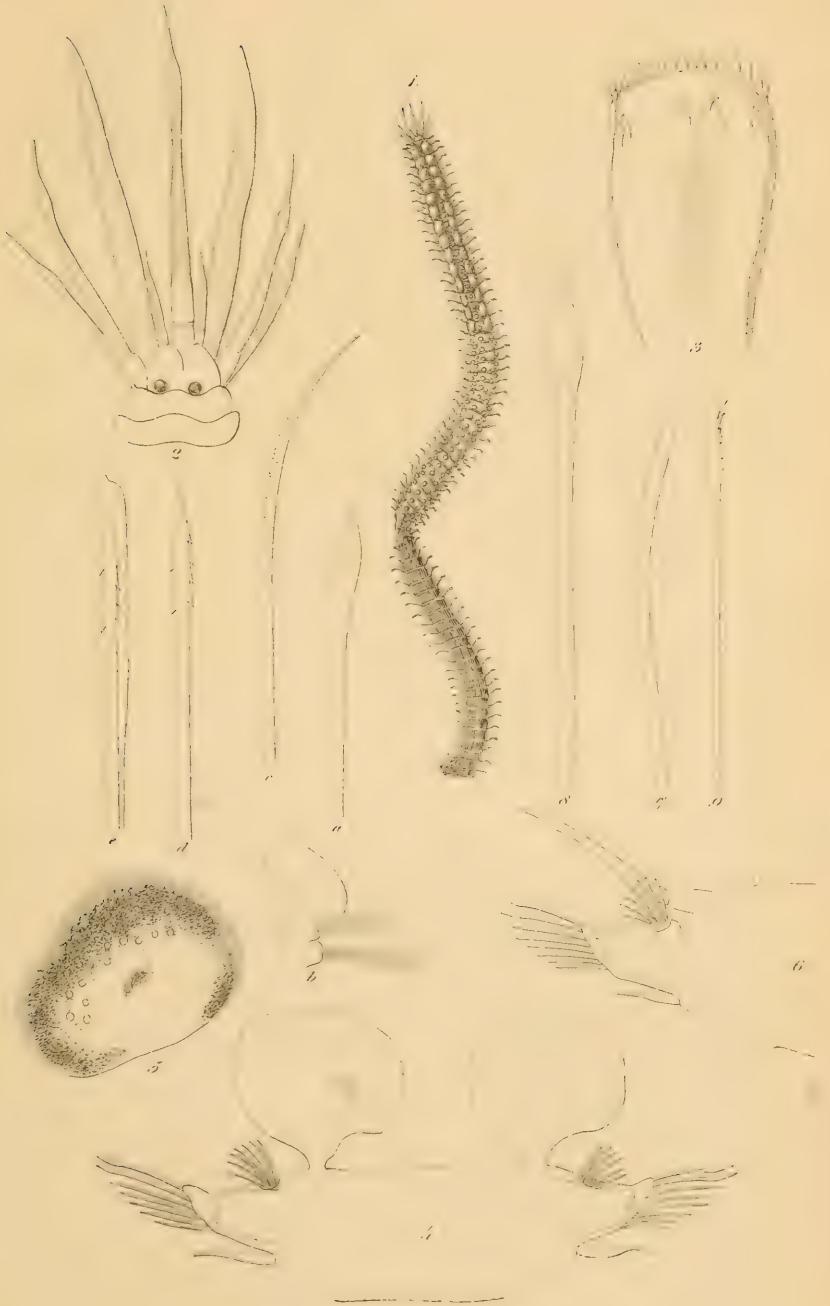

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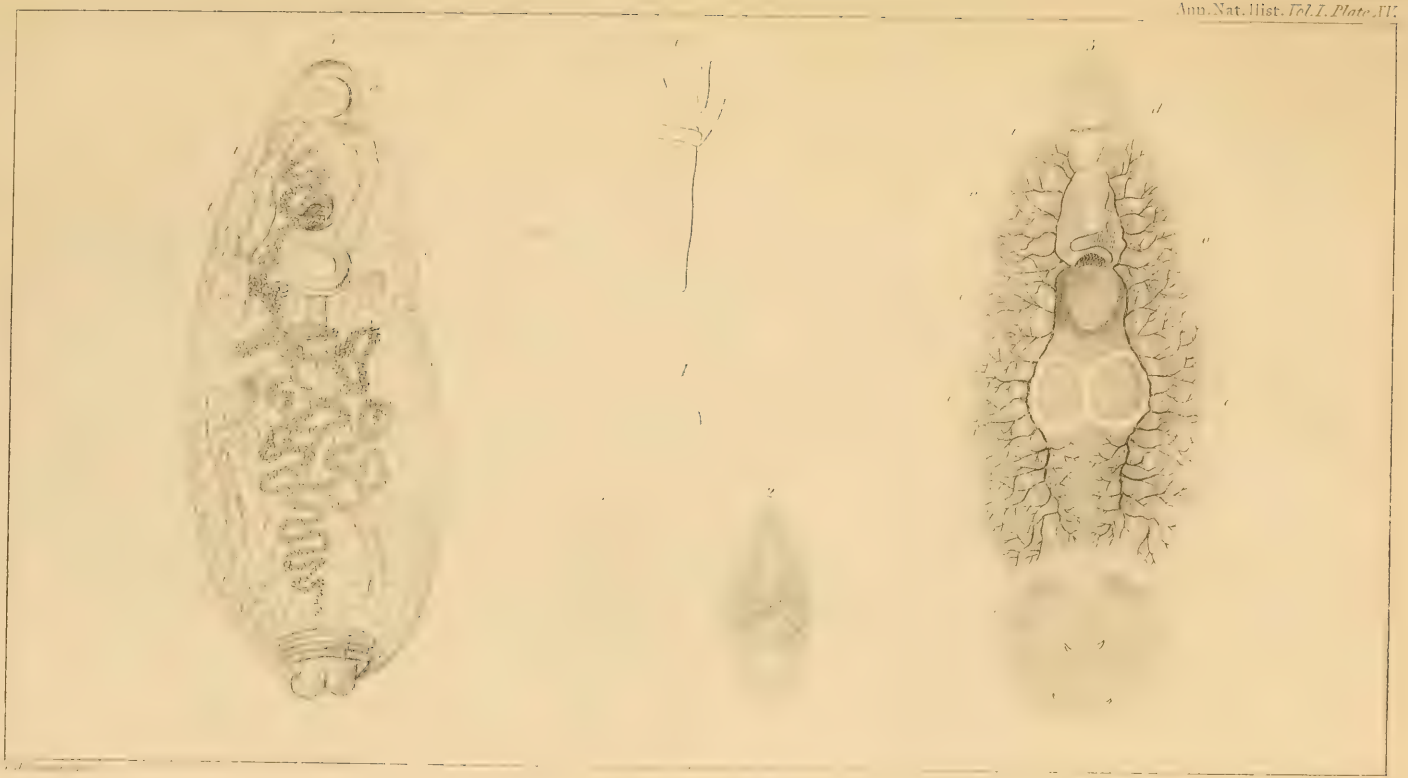

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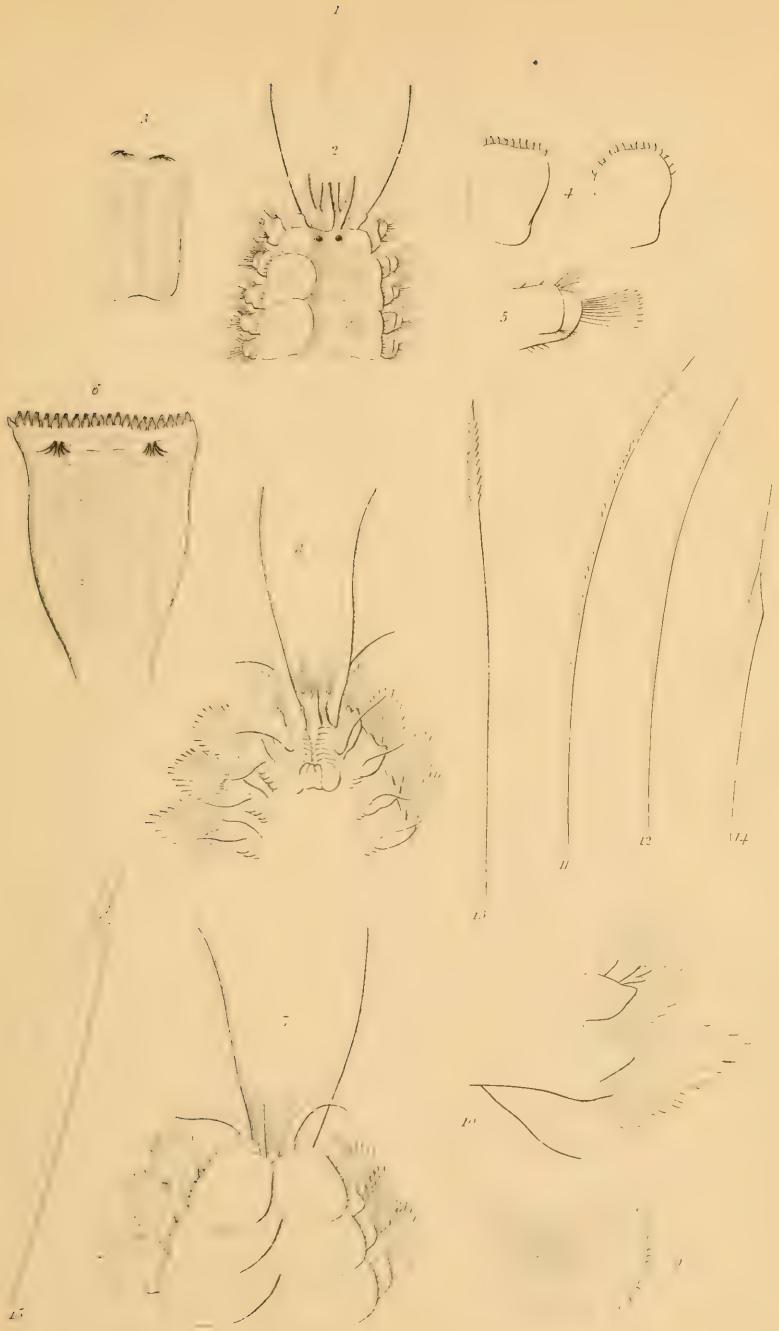

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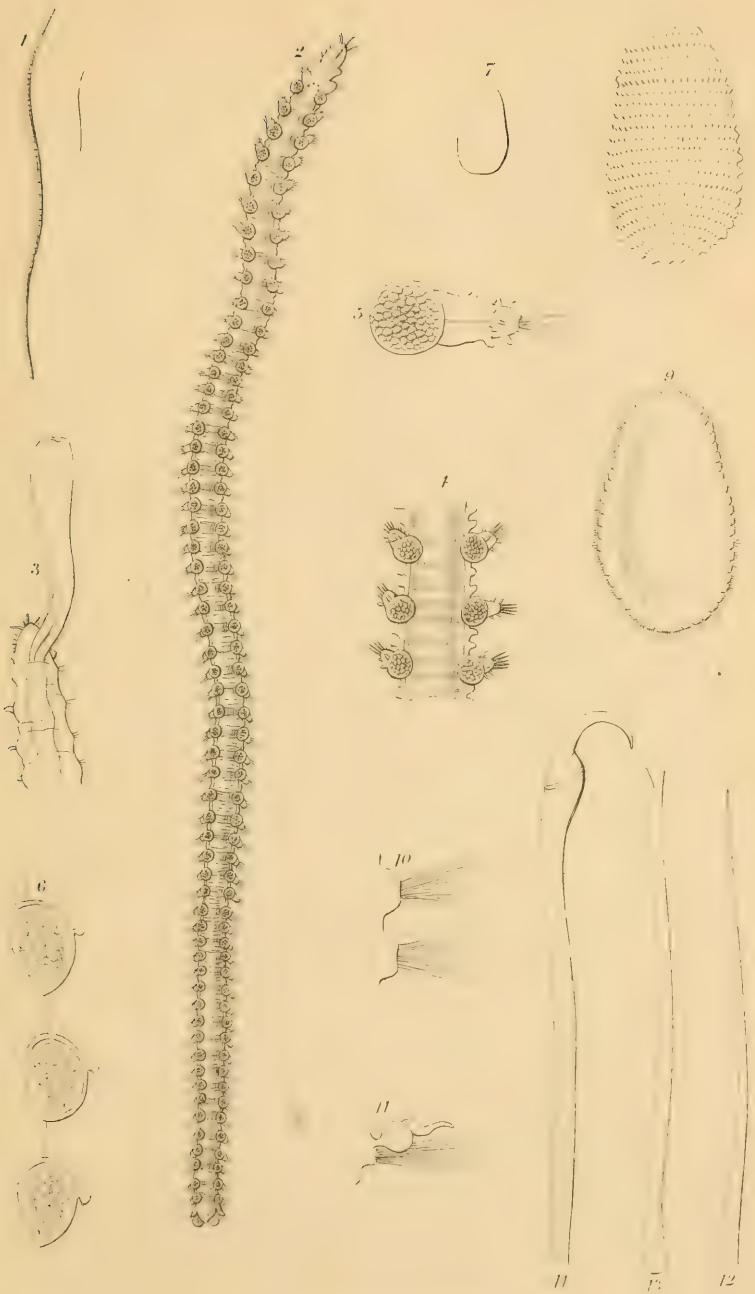

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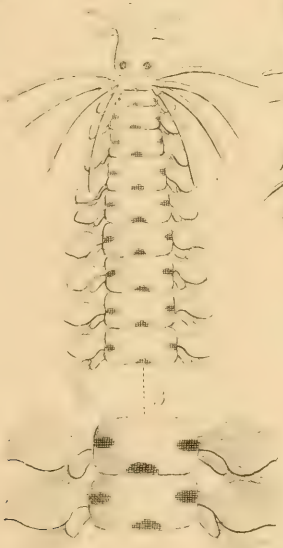
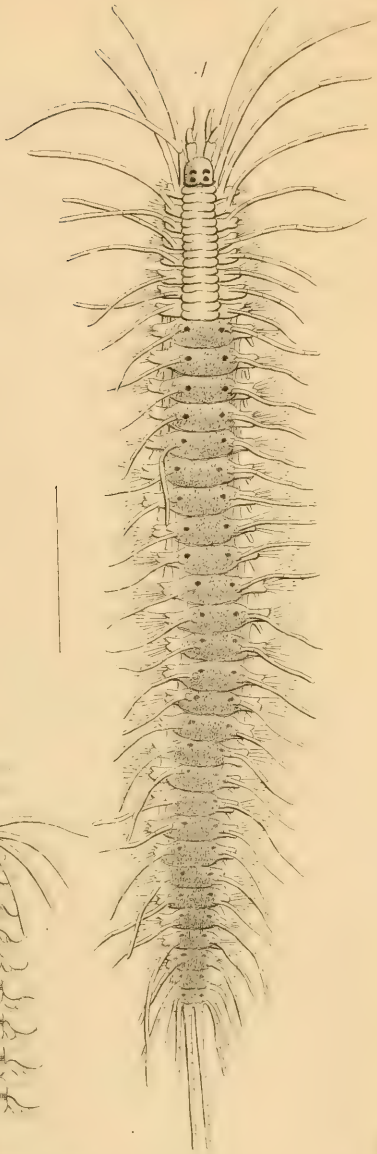




Psamathe.

British Nereides.

C. L. ad. nat. del.
J. Basire sc.

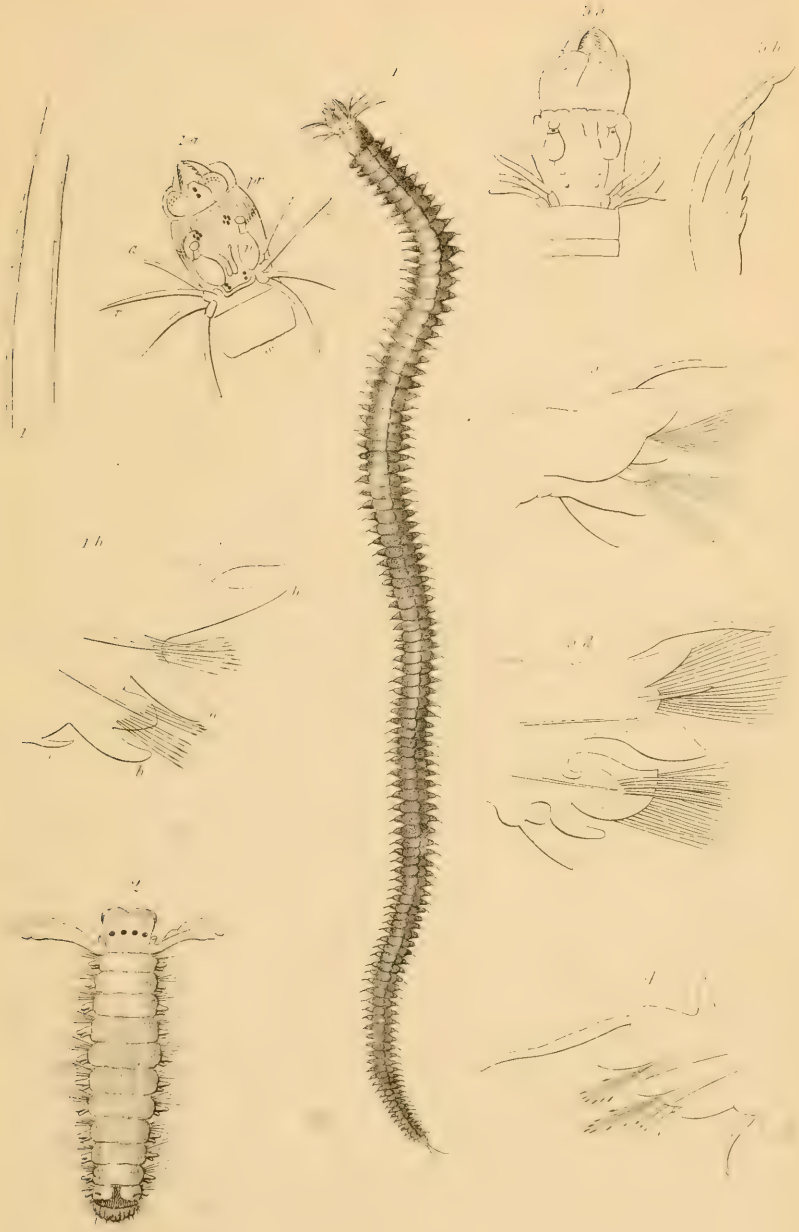
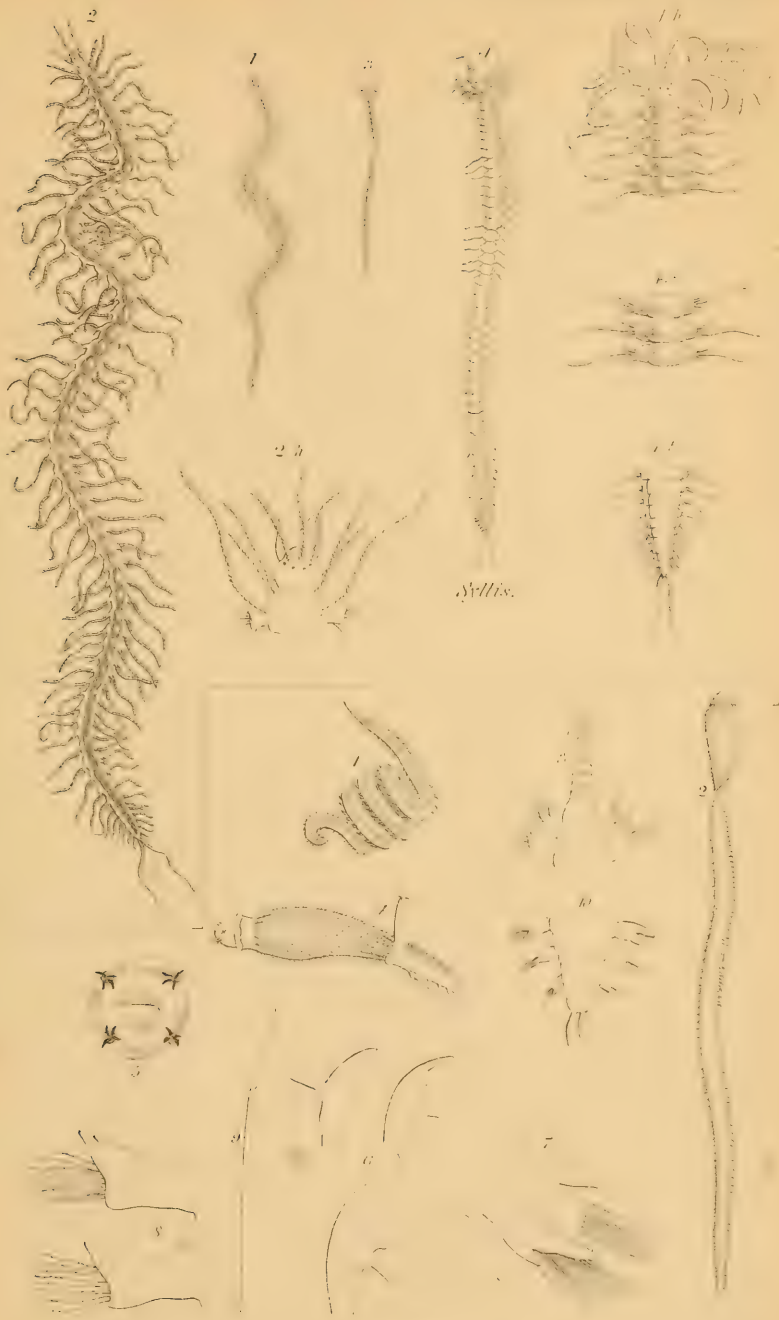


Fig. 1. Nereides.



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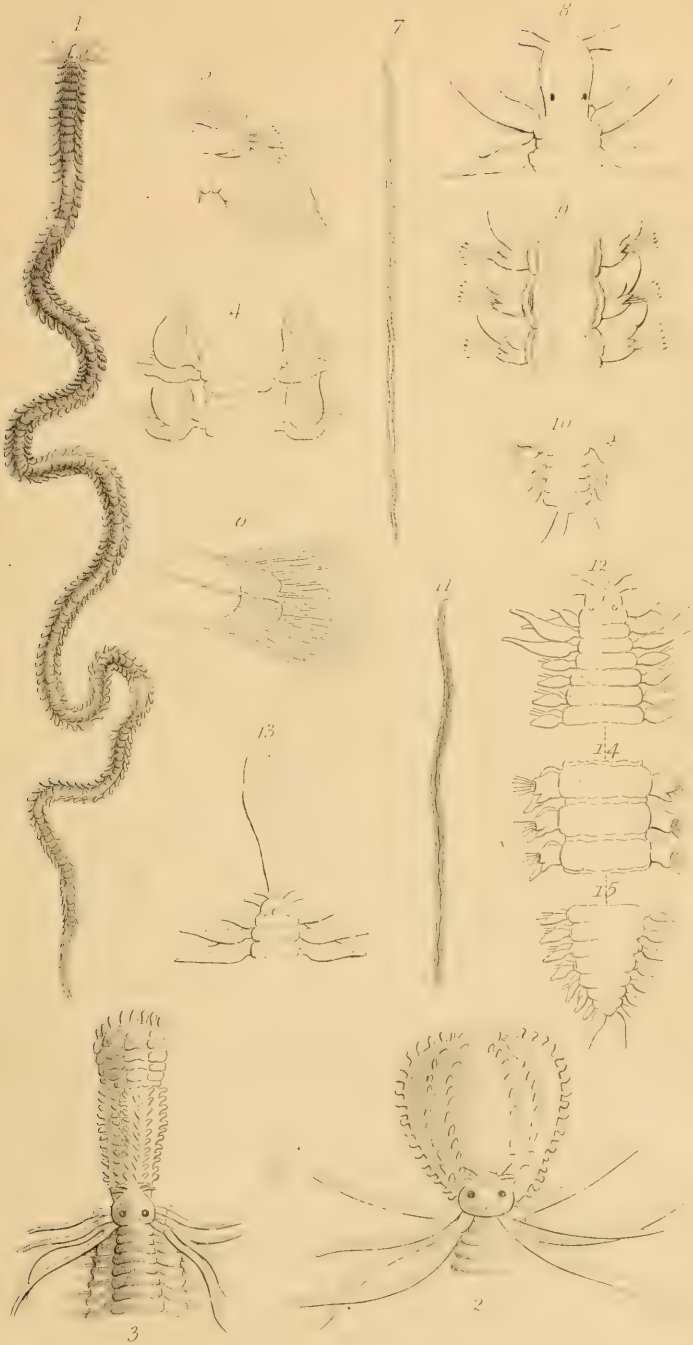

C. I. ad. nat. del.

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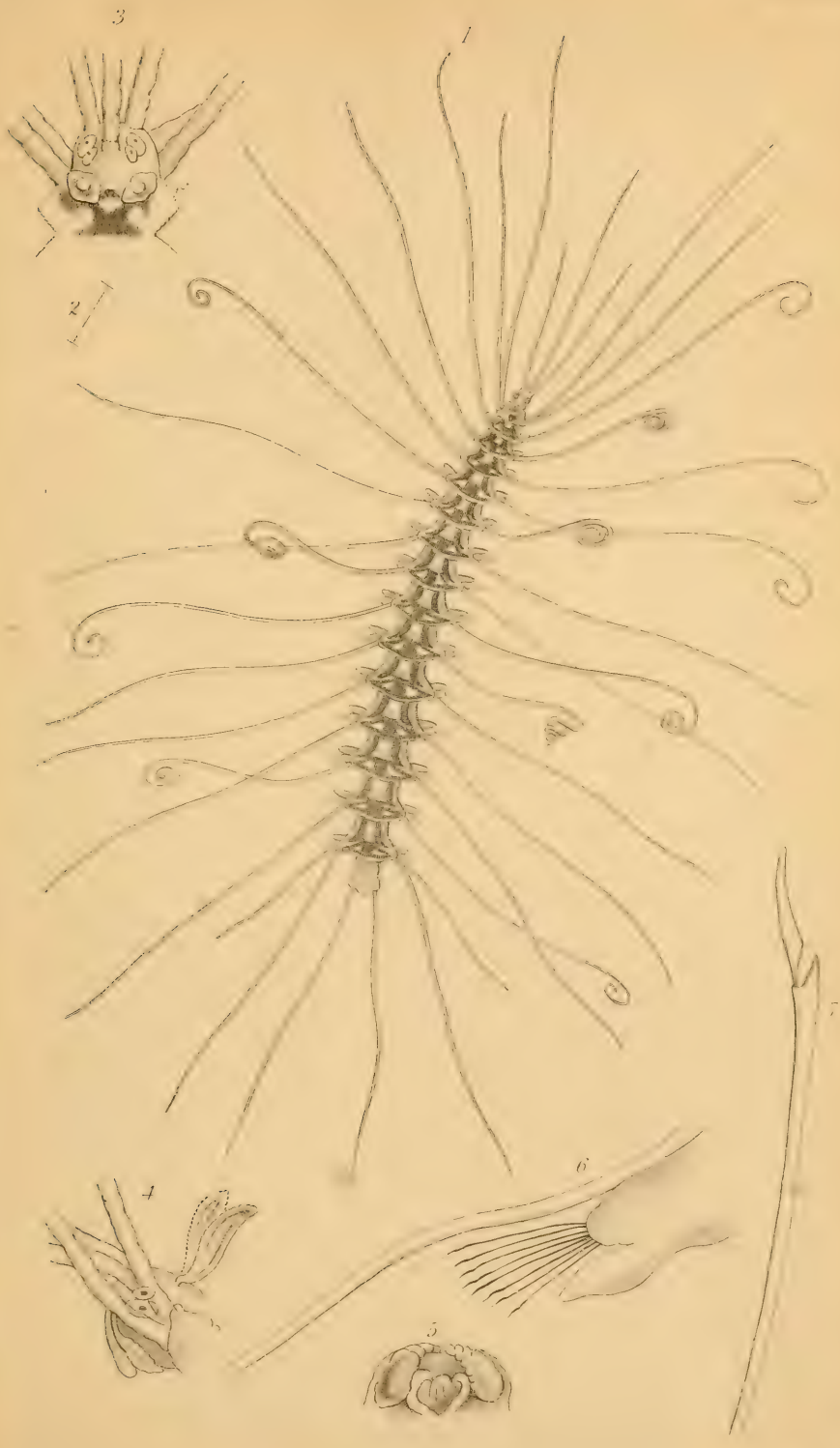
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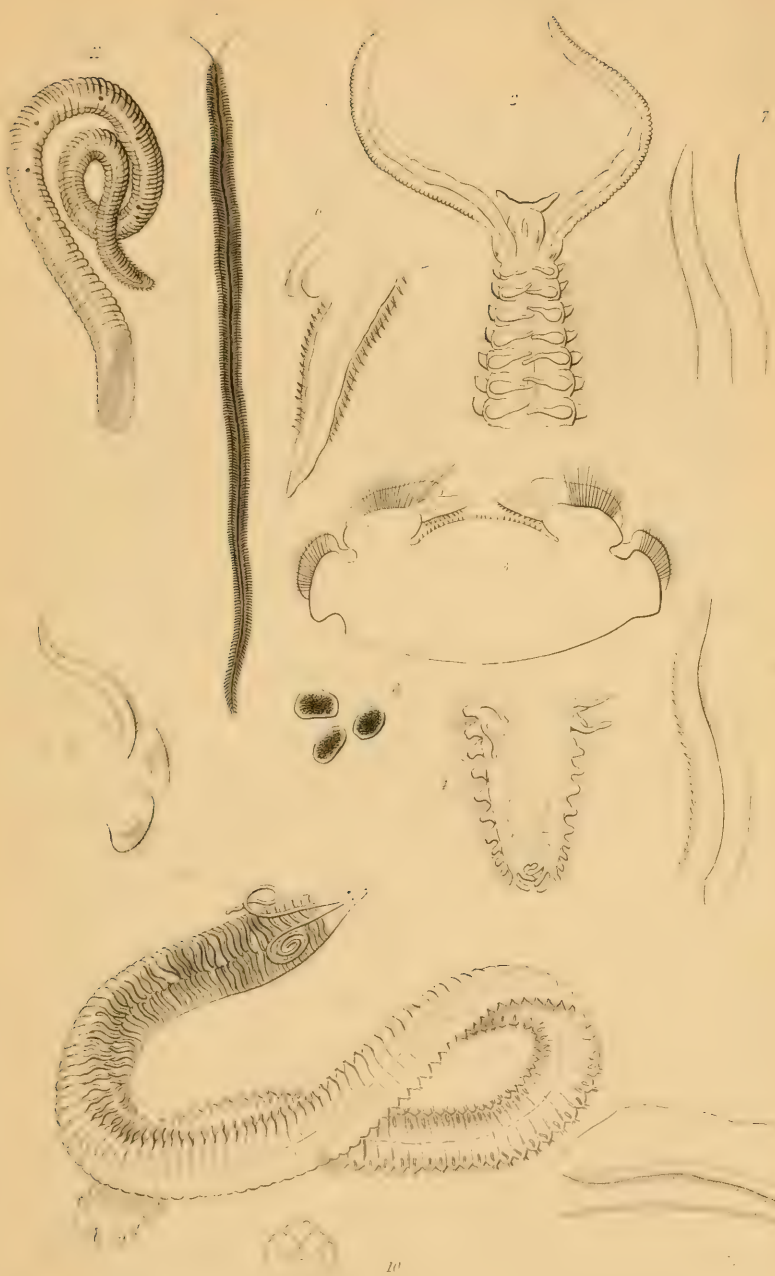

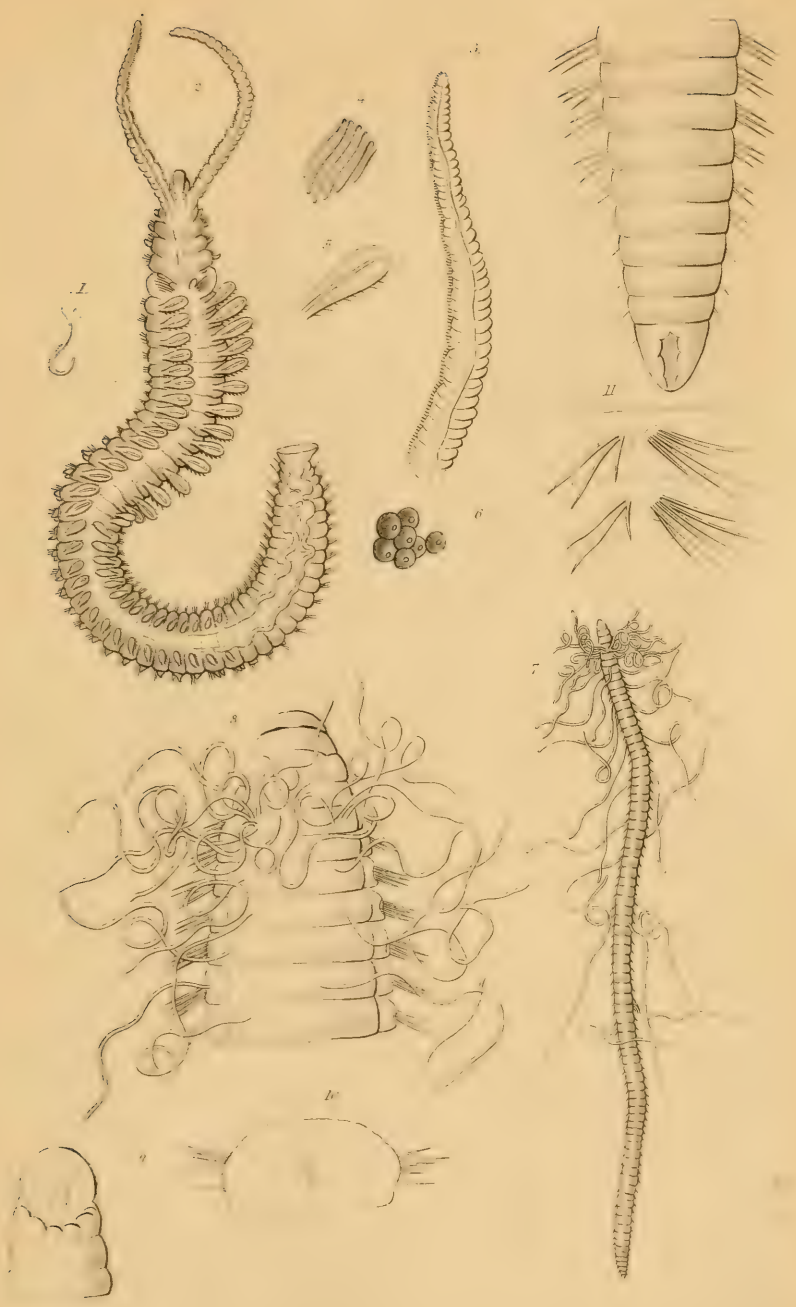

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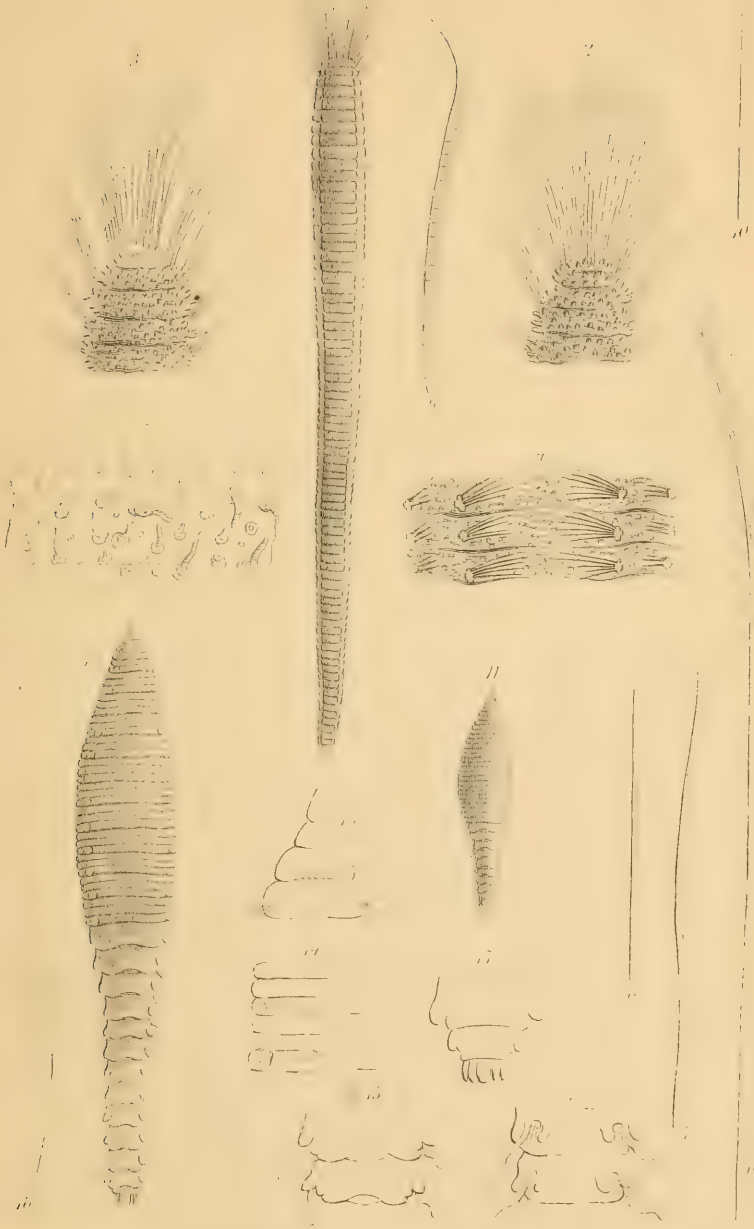

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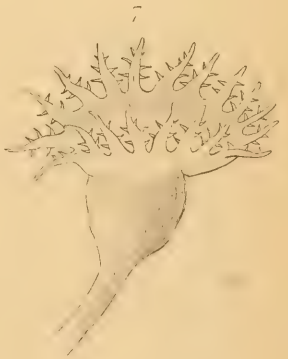
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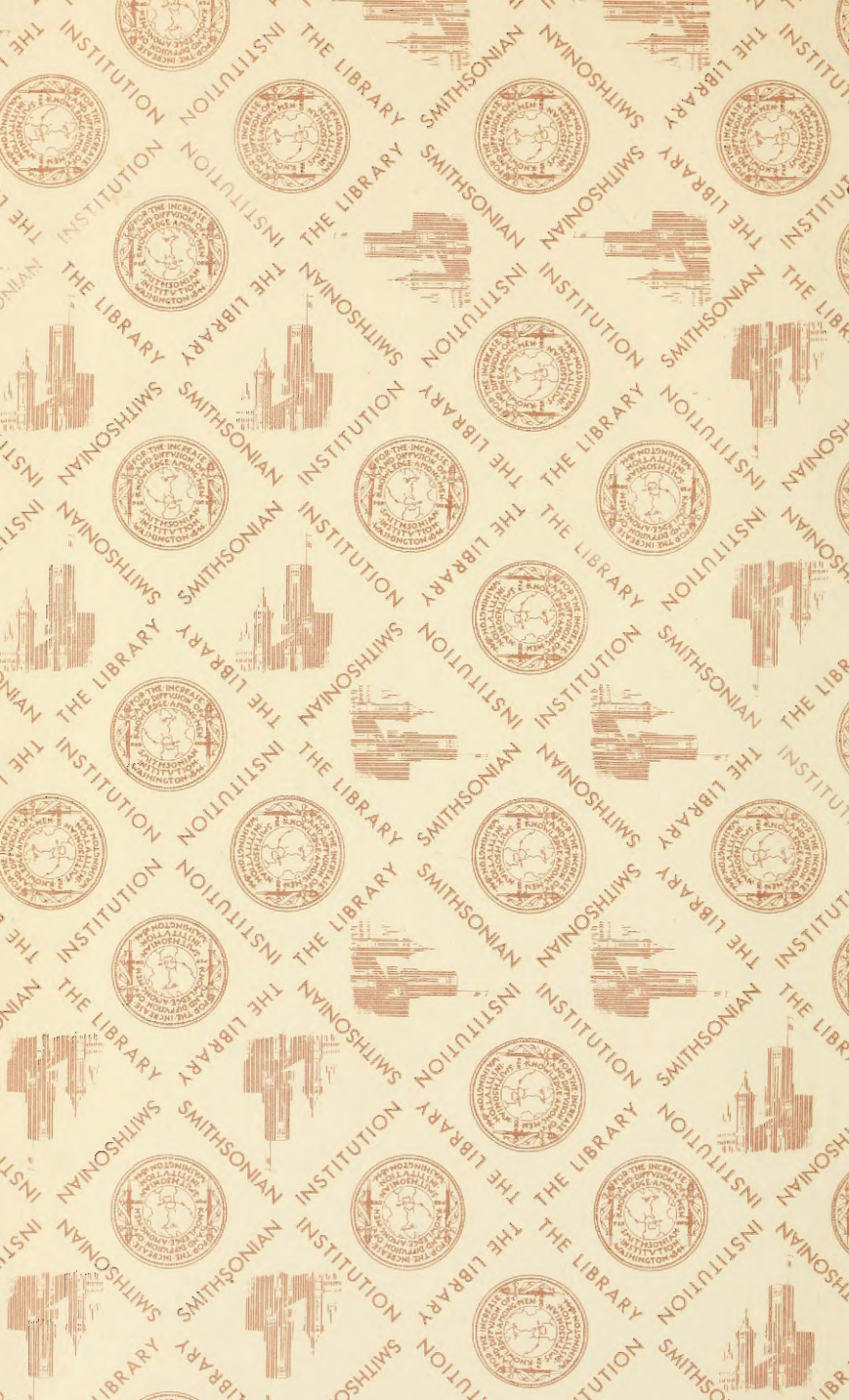
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